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CONTENTS

FIRST PART: ORIGINAL ARTICLES.

11, R. C. The Progress of Mendelian Studies in Great Britain	page 497
16, P. A. The Cultivation of Potatoes under Irrigation in the Neighbourhood Athens	501
8, A. Progress and Results in Fruit-growing in Germany	506
1, C. The Manufacture of Butter and Cheese with Culture Starters in Italy	514

SECOND PART: ABSTRACTS.

AGRICULTURAL INTELLIGENCE.

I. — GENERAL INFORMATION.

TIVE AND ADMINISTRATIVE MEASURES. — 330. Italian Law for the Protection and Increase of the Production of Live Stock in the Country. — 331. Institution of a General Directorate of Agriculture in Tunis.

MENT OF AGRICULTURE IN DIFFERENT COUNTRIES. — 332. Agriculture in the Gold Coast. — 333. Agriculture in Indo-China in 1911. — 334. Agricultural Production of New Zealand in 1912. — 335. Importation into Germany in 1912 of Produce from the German Colonies. — 336. Export of Danish Agricultural Products in 1912. — 337. Exportation of Agricultural Produce from the State of Rio Grande do Sul, Brazil.

ION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY. — 338. The Organization and Present Condition of Agricultural Instruction in Belgium. — 339. The New Plan for the Advancement of Agricultural Instruction in Canada.

JURAL INSTITUTIONS. — 340. The Land Cultivation Commission and the Land Cultivation Office in Schleswig-Holstein.

EDURAL SHOWS AND CONGRESSES. — 341. Agricultural Exhibitions and Competitions in 1913. — 342. Agricultural Congresses.

II. — CROPS AND CULTIVATION.

a) GENERAL

PHYSICS, CHEMISTRY AND MICROBIOLOGY. — 343. Occurrence and Nature of Carbonized Material in Soils. — 344. The Influence of a Preceding Crop on Nitrification in Soil.

RES AND MANURING. — 345. The Changes in Soil due to Manuring. — 346. Efficiency of Organic Manures in Dry Years. — 347. Fertilizers and Manures in Canada. — 348. A Potash Salt Deposit in the United States of America. — 349. The Use of the Phonolite of the Bohemian Mittel Gebirge as a Fertilizer. — 350. Catalytic Radio-active Manures.

b) SPECIAL

- AGRICULTURAL BOTANY. — CHEMISTRY AND PHYSIOLOGY OF PLANTS. — 351. The Effect of Light and its Effects on Vegetable Assimilation. — 352. The Effect of Weak Light on Germination.
- PLANT BREEDING. — 353. Selection of Hungarian Wheat. — 354. Comparisons of Hybrids and Selections in Oats. — 355. A Variety of Maize with Silks at the Tassels.
- CEREAL AND PULSE CROPS. — 356. Investigation of the Relation between Anther Structure and Physiological Characters in Oats. — 357. Wheat Investigations in the West Indies.
- ROOT CROPS. — 358. A Good Tuber Plant: *Arracacia xanthorrhiza*.
- FORAGE CROPS. — MEADOWS AND PASTURES. — 359. Two New Species of Clover.
- FIBRE CROPS. — 360. Cotton Industry in the West Indies. — 361. Cotton Experiments in British Guiana.
- SUGAR CROPS. — 363. Action of Light on the Growth of Seed Beets. — 364. Culture and Production of Sugar Cane cultivated on the Share System.
- RUBBER, GUM AND RESIN PLANTS. — 365. The Yield of Hevea in Java. — 366. On the Influence of Light on the Growth of *Hevea brasiliensis* with Different Yields. — 367. Manihot and Hevea. — 368. Technological Study of the Congo Rubber.
- VARIOUS CROPS. — 369. Study of *Coffea robusta*. — 370. Cacao in the French Colonies. New Species of Shade Trees for Cacao, Vanilla and Coffee Plants. — 372. Growing *C. themum* (*Pyrethrum*) *cinerariaefolium*. — 373. *Carludovica palmata* in Brazil.
- MARKET GARDENING. — 374. Some New Kitchen Garden Plants for 1913. — 375. Truffle Grounds.
- FRUIT-GROWING. — 376. A New Method of Pruning Young Vines. — 377. Researches on the Influence of Light on the Growth of Vines without Pips. — 378. Horticultural Research at Woburn.
- FORESTRY. — 379. Australian Mangrove Bark.

III. LIVE STOCK AND BREEDING.

a) GENERAL

- HYGIENE. — 380. Experimental Research on Liver Fluke (*Fasciola hepatica* L.). — 381. Annual Report of Veterinary Officer Investigating Camel Diseases in India, for Year 1912. — 382. Administration of Arsenic in Cancer of the Foot in Horses. — 383. Experimental Studies on Contagious Agalactia in Goats and Sheep.
- FEEDS AND FEEDING. — 384. The Investigation and Value of Perilla Cake and Mowrah Meal. — 385. Tomato Seed Cake. — 386. Method for the Determination of the Amount of Cottonseed Meal.
- ENCOURAGEMENT OF BREEDING. — 387. Stock Breeding in Morocco. — 388. Canadian Live Stock for the Years 1909, 1910 and 1911.

b) SPECIAL

- HORSES, ASSES AND MULES. — 389. Horse Breeding in Prussia during the Last 25 Years. — 390. Breeding Beef Cattle in Alabama. — 391. Influence of the Stage of Lactation on the Composition and Properties of Milk. — 392. Royal Jersey Agricultural and Horticultural Society.

- 393. The Decline of Commoning Flocks of Sheep in South Germany. — 394. The Italian Merino Sheep. — 395. The Merino Sheep of North Africa.
 IV. — 396. A New Method for the Industrial Preservation of Eggs. — 397. The Poultry
 ck.
 — 398. Sacbrood, a Disease of Bees.
 — 399. The Tape-Worm Disease of Roach and Bream in the Müggelsee.

IV. — FARM ENGINEERING.

- RURAL MACHINERY AND IMPLEMENTS. — 400. Comparison of Sources of Mechanical
 Power in Agriculture. — 401. A New Dynamometer for Steam Ploughs. — 402. Hand Hoe
 for Beets. — 403. The Præner Drill. — 404. The Present State of Milk-Drying Technique.
 PIG CONSTRUCTION. — 405. A Practical Flooring for Pig Styes.

V. — RURAL ECONOMICS.

- THE LIMIT VALUE OF THE MEANS OF AGRICULTURAL PRODUCTION AS BASIS FOR THE CALCULATION OF
 THE ECONOMIC LIMIT OF OUTLAY. — 407. The Profitableness of Hoed Crops. — 408. Three
 YEARS' RETURNS OF THE CO-OPERATIVE ASSOCIATION'S PASTURE AT KLEINMÜHLENGEN IN ANHALT.
 409. Native Labour in Tunis. — 410. Agricultural Book-keeping in Austria.

VI. — AGRICULTURAL INDUSTRIES.

- INDUSTRIES DEPENDING ON ANIMAL PRODUCTS. — 411. Extract from the Report of the Swiss
 Dairy Institute in Berne for the Year 1911. — 412. The Alpine Dairy Industry. — 413.
 Manufacture of Cheeses in the Grisons from Skimmed Cow's Milk and Whole Goat's Milk. —
 414. On the Forms Assumed by Phosphorus and Calcium in Milk Casein. — 415. The Jerked
 Meat Industry in Argentina. — 416. A Method of Determining Starch in Meat Products.
 INDUSTRIES DEPENDING ON PLANT PRODUCTS. — 417. The Sugar Industry in North-East Bra-
/>
 zil. — 418. White Liqueur Wines. — 419. The Ageing of Bottled Wines. — 420. California
 Almond and Nut Output.

PLANT DISEASES.

I. — GENERAL INFORMATION.

- LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS. — 421. Legis-
 lation on Plant Diseases in the Colony of Mauritius. — 422. The Regulation of November
 1912, for the Transport of Vegetables in Uruguay. — 423. Order on the Control of Lo-
 tions in Spain.

— DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

- Infectious Chlorosis of Citrus Trees.

III. — BACTERIAL AND FUNGOID DISEASES.

a) GENERAL

FUNGOID DISEASES. — 425. The Contamination of the Soil by the Toxic Products of Fungi. — 426. Researches on the Disease caused by *Rhizoctonia violacea*. — 427. Re on the Development and Control of Vine Mildew.

b) SPECIAL

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS. — 428. *Sterigmatocystis nigra* Tobacco in Hungary. — 429. A Disease of Tomatoes. — 430. *Botrytis cinerea*. *Uromyces hynlosporus* sp. nov. causing the Disease of the Shoots of *Acacia confusa*.

IV. — PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

432. — On the Behaviour of the Seeds of Wild Plants in the Soil and the Poor Result Destruction of Weeds obtained by Cultivation. — 433. Canary Island Broom *canariensis* Stendel) in Tasmania.

V. — INSECT PESTS.

a) GENERAL

MEANS OF PREVENTION AND CONTROL. — 434. The Simultaneous Destruction of *Coleoptera* and Lucerne Dodder by Calcium Cyanamide. — 435. The Control of *Conchylis* in Zealand in 1912. — 436. The Destruction of the Larvae of *Conchylis* and Aphids in Trees. — 437. Enemies of Barley. — 438. Cotton Pests in the West Indies. — 439. *thrips phaseoli* sp. nov., Injurious to Beans in Texas. — 440. *Hypolycaena philipp* Enemy of Pine Apples at Sao Paulo, Brazil.

NE. The Intelligence contained in the present Bulletin has been taken exclusively from the periodicals, bulletins, and other publications which have reached the Library of the Institute of Agriculture in Rome during the months of February and March 1913.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.
ORIGINAL ARTICLES

The Progress of Mendelian Studies in Great Britain

by

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the dramatic discovery of Mendel's work on plant hybridisation inaugurated a new era for the breeder of plants and animals, the opportunities for advance in the knowledge of heredity were in many countries more rapidly seized than in Great Britain. The seed here sown on prepared soil, for the problems to which Mendel found a key had already begun to engage the attention of Mr. Bateson and of Miss Bates in Cambridge. The account of the experiments which they started in 1897 and published as the well known 1st Report of the Inheritance Committee to the Royal Society in 1902 was the most important contribution to the subject since Mendel's own paper, and was the one which opened men's eyes to the vast possibilities latent in Mendel's work. A group of workers rapidly gathered round Bateson in Cambridge, and their contributions to be found under the names of Doncaster, Gregory, Staples-Browne, Miss Durham, Miss Wheldale and others bore witness to the activity of the rising school of genetics in the University. All this work, like Mendel's own, was designed and carried out purely in the desire to gain definite knowledge of the workings of heredity, little or no attention was paid to the economic results which might follow from the application of this knowledge to the affairs of those who bred animals and plants for profit. The material for study was selected on the ground of its cheapness, of the ease with which it could be worked, of its suitability for giving a speedy answer to the problems put to it — sweet-peas, mice, stocks, moths, snaphdragons and poultry — such was the material investigated, and except for the last named it could hardly be said to possess much economic importance.

But it so happened that the stimulus to genetic work coincided with the rapid rise of the School of Agriculture in the University, and the enormous practical importance of the new knowledge was immediately appreciated by Professor Biffen, who was then starting his now famous experiments in the crossing of cereals. By making use of the methods of Mendelian analysis he was able to show that such qualities as strength, and immunity to rust were transmitted in accordance with Mendel's

law of segregation and consequently are under the control of the breeder, who can now devise suitable experiments for combining them together at will. Improved wheats of this kind have already come into use in England, and judging by the competition there is to secure the best they have already proved themselves a great success. The analysis of the wheat plant is still being actively carried on in Cambridge by Professor Biffen and his co-workers, and there is no doubt that as time goes on even better and more profitable varieties will be at the service of the British farmer. It is pleasant to be able to record that the importance of the work has been recognised by the Government, who have placed a considerable annual sum at the disposal of the School of Agriculture for research in plant-breeding. This has rendered possible an increase in the scope of the work, and experiments are now being carried on with other plants besides cereals. Among investigations now under way are some concerned with the transmission of fertility in fruit trees, the striking success of Biffen's work on the nature of immunity to rust in wheats has led to the search for naturally immune individuals in other forms of plant life. Experiments with potatoes have been in progress for several years and thanks to the energy of Dr. Salaman, working on his own estate near Cambridge, and of Mr. Lesley of the School of Agriculture, the formation of a decent potato, naturally immune to *Phytophthora infestans*, seems within measurable distance of realisation.

Nor are the researches at Cambridge confined to plants. Sex-linkage was one of the first subjects of experiment by Bateson and during the past ten years much has been learned of the transmission of sex-linked characters. Offering as they do a number of features showing sex-linkage in inheritance (1), poultry are of importance for gaining an insight into the nature of sex, and of studying the peculiar influence of each sex in the transmission of hereditary properties. Several of these sex-linked characters are now under investigation at Cambridge, while parallel experiments are being carried on by Professor Bateson at Merton.

Two other series of experiments likely to lead to knowledge of economic value are also being carried on at Cambridge. The first of these is concerned with the inheritance of size, and consists in carefully following out the result of a cross between an ordinary fowl and a bantam. The work is not yet sufficiently advanced to permit of complete analysis, but the nature of the F₂ generation raised last year strongly suggests that size depends upon definite factors which exhibit ordinary Mendelian segregation. The other set of experiments mentioned concerns the inheritance of the brooding instinct in the hen and of the brown color of the egg-shell. In England brown eggs are of greater value than white, but hitherto no breed laying brown eggs and in which the hens never cease to sit has yet been established. It may be that brown eggs are incompatible with the non-broody habit, just as it is sometimes stated

(1) See No. 1319, B. Sept. 1912.

d of cattle cannot be at the same time first rate in both milk-production and beef. It is hoped that the experiments in progress will eventually give definite evidence upon this point.

Experiments have also been undertaken with sheep where the results of a cross between Merino rams (from Australia) and Shropshire are being carefully followed. The experiments have just reached the second generation, and it is hoped that the knowledge gained from them will eventually render it possible to combine the fleece of the merino with the good mutton qualities of other breeds.

Besides the work just mentioned, there are other sets of experiments being carried out at Cambridge and Merton which may be regarded as forming a group by themselves. Bateson in 1905 was the first to describe in sweet-peas a remarkable case in which two characters each exhibiting ordinary Mendelian segregation nevertheless showed a peculiar association with regard to one another. In this particular instance the characters dealt with were colour, blue being dominant to red, and polype, long being dominant to round. Blue long \times red round gave in F_1 and in F_2 the expected ratio 3 blue : 1 red and also 1 long : 1 round. But the proportion of rounds among the blues was only 1 in 12, whereas among the reds the rounds were in excess of the expected to the extent of about 3:1. Since that date many other cases of peculiar association of characters have been discovered in other plants, as in sweet peas, and certain generalisations have emerged from the study of them. We now know that if A and B represent two factors which alternately alternate to their absence (a and b), then if the original cross be the nature $AB \times ab$ the characters A and B will be more or less closely associated in the F_2 generation so that of the 4 possible classes $3:Ab:aB:ab$ the first and the last will be the most numerous. However, the original cross is of the form $Ab \times aB$, then of the four in F_2 the AB one will be about twice as numerous as either of the classes Ab and aB , while the class ab will be very rare. Where A and B go into the cross in association they tend to remain associated in the F_2 whereas when they go in to the cross dissociated they tend to remain dissociated in F_2 . This peculiar phenomenon is not as yet properly understood, and it is with a view to obtaining further knowledge that experiments are being carried on at Merton by Professor Bateson, and at Cambridge by Miss Saunders with stocks, by R. P. Gregory with primulas, and by the writer with sweetpeas.

Recent work, more especially that of Morgan in America, has shewn that similar phenomena occur in animals, and there is no doubt that a better understanding of them will eventually turn out to be of much importance for the breeder of plants and animals. It is a matter of common observation that characters seem at times to be transmitted in bunches, as if they were from one parent or other to the offspring, and it is likely that in such cases we are dealing with phenomena of the kind just outlined. The best equipped Institute in Great Britain for the study of genetics is undoubtedly the John Innes Horticultural Institution at Merton.

near London. Started in 1909 with funds derived from private bequest it was fortunate in securing Professor Bateson, who left Cambridge in 1910, as its first Director. Fortunately also its scope is broad and the experimental work undertaken is concerned with the unravelling of the principles of inheritance in the widest sense, apart from considerations of direct economic return. Numbers of experiments are at present being carried out by Professor Bateson and his staff, principally with plants, the not the least interesting being a series of experiments dealing with fertility and sterility in fruit trees.

Besides Cambridge and Merton there are several other places where genetic research is being carried on. Mr. Hurst, one of the pioneers of Mendelian studies, has established an experimental station at Broom's Barn near Leicester, which aims at the production of economically valuable varieties of plants and animals by working upon Mendelian lines. Hurst is experimenting with many different plants and animals, and some of his most interesting experiments concern horses and aim at the production of a pure race of steeplechasers, *i. e.* of animals with a special aptitude for hunting.

Genetic research is also being carried on by Professor Keeble at University College Reading, the chief material investigated being *Impatiens noli-tangere*. But perhaps the most interesting work from this source is dealing with the chemical side of genetic problems. It is well known that in *primulas* there are white flowers of two kinds, *viz.* those dominant and those recessive to coloured. Professor Keeble and Dr. Armstrong have recently amplified the work of Miss Wheldale and others, and have demonstrated that these two forms of white, though alike in appearance, can be distinguished by definite chemical tests. Such work opens up a new and important field of study, and it is possible that as this branch of knowledge develops the genetic analysis of plants and animals will be greatly simplified by the substitution of direct chemical tests for the elaborate series of breeding experiments which are at present necessary.

Among the experimental work in progress in England should be mentioned that of Mr. Staples-Browne, of Bampton near Oxford, who is continuing his researches with pigeons, more especially with reference to sex-limited characters; also the work of Trow of Cardiff, who has recently contributed a valuable paper on inheritance in *Senecio*. In this paper, and in another shortly to appear Dr. Trow has made a definite advance in the understanding of those peculiar cases of association between characters to which reference has already been made.

In Ireland, Professor Wilson of Dublin has lately brought together a number of records dealing with the heredity of coat-colour in horses and with the milking capacity of cows.

Scotland has also made a start by creating a Lectureship of Genetics in the University of Edinburgh, to which Mr. Darbishire was recently appointed.

In conclusion, it should be mentioned that the study of genetics in Great Britain is not confined to those who work on these islands.

sends her students all over the world, and the value of genetic sh to the breeder is evidenced by the work of Balls on cotton in and by that of Leake and of Howard on cereals, cottons, and plants in India.

The Cultivation of Potatoes under Irrigation in the Neighbourhood of Athens

by

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be climate of Attica, and indeed of the whole of Greece, is charac-
by severe drought in summer. Numerous observations made
National Observatory at Athens show that the mean rainfall
ens during the spring months February to June is about 150 mm.
(1) it scarcely ever snows, and as the rain is mostly torrential,
if the water flows rapidly to the sea.

account of the drought, the potato crops and most of the other
bles are cultivated on irrigated land, except in the most northern
ces of the Kingdom, as Corfu, Manissa (Thessaly), or in some of
lleys of the Peloponnesus (Arcovia, Laconica) (2) suited at high al-
where, the summer rainfall exceeds that enjoyed by the plains.

t Athens, as in all large cities, an enormous quantity of potatoes is
ned, and as the supply produced in the vicinity is relatively small,
growing has for some years extended from the plains of Attica
neighbouring plains capable of irrigation.

The following data are from the Athens Observatory:

Month.	Number of days with rain	Rainfall.		Atmospheric humidity
		mm.	in.	
January	11	55.9	2.28	72.8
February	11	37.6	1.47	74.4
March	11	57.2	2.23	70.4
April	8	22.3	0.87	63.7
May	7	21.4	0.83	58.8
June	4	11.3	0.44	43.3

(Author's note).

Annual rainfall at Athens	421.6 mm.	16.60 in.
" " Corfu	1171.1 "	46.11 "
" " Zante	979.5 "	38.56 "

(Author's note).

The annual production of the villages of Attica is about 5000 tons but though it increases every year in a surprising manner, the supply is insufficient; consequently, large quantities of potatoes from the neighbourhood of Thebes or Corfu (2) are also consumed in Athens.

VARIETIES OF POTATOES GROWN IN GREECE.

Two varieties of potatoes are grown in Attica; these were long imported from Trieste and are known on the market under the names of the villages where they are most cultivated.

1) "Patissiotiki" or "Platicote" (Patissia or flat potato). It is somewhat small, about the size of a hen's egg, flattish, rounded; superficial; skin regular, yellowish red; flesh yellowish, firm. Its starch content, according to the analyses of the Laboratory of Agricultural Chemistry of Athens, is 13.5 per cent (3). This variety is the most common on the markets and its retail price is always 5 or 10 lepta ($\frac{1}{20}$ to $\frac{1}{10}$ of an oke (2 $\frac{1}{4}$ lbs.) more than that of other varieties. Its vegetative period lasts about 4 months.

2) "Kerkyraiki" or "Stronggili" (Corfu or round potato). Tubers medium or large, rounded oval, smooth-skinned, golden yellow, eyes sunk; flesh distinctly yellow, less firm than that of the previous variety. Starch content 15 per cent. Its yield per acre is a third less than that of the Patissia variety. Its vegetative period is 4 months.

(1) The production per village is:

	tons
Patissia	1343
Kifissia	590
Chalandri	422
Amaroussi	837
Menidi	1770
Eleusis	59
Aspropyrgos	284

(Author's note)

(2) The production of the neighbourhood of Thebes for the year 1911-12 was 6140 tons, of which the greater part was sold on the Athens market.

(Author's note)

(3) The analyses were as follows:

Variety		Weight of tuber	Water	Dry Matter		Starch
				—	—	
		gr.	%	%	%	
Patissiotiki	No. 1	139.0	79.4	20.6	14.3	
"	" 2	100.6	79.9	20.1	14.3	
"	" 3	72.5	82.7	17.3	11.5	
Kerkyraiki	" 1	133.5	77.8	22.2	16.4	
"	" 2	103.2	79.6	20.4	14.6	
"	" 3	98.5	80.2	19.8	14.0	

(Author's note)

the varieties of potatoes imported from Germany and grown at the Rural Station of Tyrintha produced small tubers which found no buyers on the markets.

SEASON OF PLANTING.

in districts where the potato is irrigated, two crops are grown in the year, either in the same, or in different, fields. The date of the first planting is from the end of January to the end of February and the crop is lifted from the middle of June to the middle of July: this is the "winter crop."

The second time of planting is from the end of July to the end of September and the crop is lifted from the end of October to the end of November: this is the "summer crop."

On account of the scarcity of potatoes on the markets, the crop is lifted before it is ripe, the loss entailed by diminution in weight being made up by the higher prices obtained at these seasons.

ROTATIONS.

Most cultivators, as a rule, grow two crops a year on the same land for several years, manuring the soil annually with the fertilizer mentioned. When the soil shows signs of fatigue (generally after 3 or 4 years of consecutive cultivation) they replace the summer potato crop by barley sown early for fodder, and the winter crop by maize for fodder, or vegetable crop.

In some centres, where the value of land is relatively small, the potato grower prefers only raising one crop annually in the same field — the summer crop which fetches the highest price (July-November) — and then sowing fodder barley.

SEED SELECTION AND PREPARATION.

The largest potatoes are selected for seed, or at any rate those as big as a hen's egg. These must be from the crop immediately preceding. Those for winter cultivation should be from the preceding summer crop and those for summer cultivation should be the produce of the preceding winter.

Potatoes required for seed are left in the soil to ripen thoroughly. When pulled up, the selected tubers are wiped with a piece of linen to free them from all the earth. Potatoes for summer cultivation, dug at the end of the year, are left for 1 or 2 days on the field to dry a little; then they are taken to a shed or under a tree, where they remain 30 to 40 days; during this time they wrinkle owing to loss of moisture, which causes them to shrivel readily on planting. This drying until they wrinkle is essential both for winter and summer cultivation, for otherwise most of the buds do not develop when the potato is put in the ground. During this

time the heap is turned once or twice so as to air the potatoes, 4 or 5 days before planting they are watered a little.

The seed potatoes for the winter crop (dug in November, planted in January) are kept in a very thin layer, in a light, dry, well ventilated place, where they very soon turn green.

Before planting, the tubers are cut into two or three, or even four pieces, but care is always taken that each piece shall contain at least three strong eyes. The seed-potatoes of the summer crop can be kept for some days after being thus divided provided they are covered with cloths or straw kept damp.

Some growers prefer Kerkynalki for the winter crop and Paktiki for the summer crop. In this case they grow a small area of the variety at each season to provide seed for the ensuing crop for others, in order to obtain earlier growth in the following crop dig seed potatoes about 20 days before they are quite ripe.

PREPARATION OF THE SOIL AND PLANTING.

A. Winter crop (February to July). — Careful cultivators prepare their fields in winter by two cross ploughings, followed by picking up the soil to a depth of from 16 to 20 inches before planting. Others are satisfied with one or two deep ploughings. At the time of planting, the soil is fully levelled and then divided by ridges into lands 3 ft. to 3 ft. 6 in. wide. In these lands, furrows are opened at 10 to 12 inches apart and 4 to 6 inches deep according to the compactness of the soil. In order to economise the ground, the ridges separating the irrigation lands are planted. Often indeed the planting is done first and the ridging afterwards.

The seed potatoes are then placed at the bottom of each furrow 10 to 12 inches apart and at once covered with a large handful of rotted stable manure or with a mixture of this and grape pomace. The potatoes remain thus until March, when the soil is thrown over them with a hoe.

The manure destined for the potato field is prepared and placed in a heap a long time beforehand; it can be purchased at about 75 c. per ton. In winter, when rendered very damp by the rain, it is turned over twice, grape pomace often being added in the proportion of a quart to a bushel.

In Attica, dung is the only fertilizer used in growing potatoes. It is applied at 12 to 16 tons per acre. The use of chemical fertilizers is not spread, owing to the want of success obtained with them, which was due to ignorance of the way to use them.

B. Summer crop (August to November). — Thanks to the digging crop of potatoes, there is generally a good tilth on the land for the summer crop. Before planting, when possible, it is ploughed somewhat deeply. It is often necessary to water to facilitate this planting, which is carried out in the dry season. The soil is then levelled.

d into lands as for the winter crop; These are then thoroughly hoed and later picked to a depth of about 12 inches as soon as possible. The potatoes are planted like the winter crop, but closer together, 8 to 10 inches in both directions. The sets are covered and the surface is levelled.

For this crop, no manure is used, as the growers consider that at this season it raises the temperature of the soil, thus disturbing the normal development of the plant. Further, the manure left in the ground from the preceding crop is considered sufficient. Seed potatoes which have been grown in the ridges are preferred.

The amount of seed per acre is $11\frac{1}{2}$ cwt. in the case of the winter crop and $14\frac{1}{2}$ cwt. for the summer crop.

HOING AND WATERING.

A. *Winter crop.* — As has been already remarked, the first hoeing is done towards the middle of March. Later, when the young shoots are 6 inches high, the soil is hoed once more (called "dry hoeing"). Ten days, if the ground is dry, it is watered for the first time and subsequently, as soon as it can be worked, is hoed and the rows are slightly raised up. Afterwards, whether the weather is wet or not, the field is hoed nearly every week, but without hoeing; all these irrigations are effected out by flooding each land, the water being conveyed by means of small channels.

B. *Summer crop.* — Some days after planting, a light hoeing is done to break up the crust formed by the watering subsequent to planting. After 12 to 15 days the field is again watered, and hoed as soon as the condition of the soil permits; 8 to 10 days later, if it has not rained, the field is watered and hoed once more; if it has rained, the watering is deferred. This process is repeated about every week, till there is fear of disturbing the young plants with the implements. Watering at longer intervals, according to whether there is rain or not, continues till the end of October.

LIFTING THE POTATOES.

The best time for this is when the leaves and haulms turn yellow, the change of colour being accompanied by the maturity of the potatoes. Generally the winter crop is gathered during the second half of October and the summer one at the end of November. The yield per acre of the former is 7 to 10 tons, and of the latter about 8 tons.

The average wholesale price of the winter potatoes, where they are sold, is near £5 per ton and that of the summer crop £8; they fetch 2d. per pound when sold retail in Athens.

Progress and Results in Fruit-Growing in Germany

by

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All the progress in fruit-growing in Germany in the last decade most of the work on the subject has been in the direction of the improvement and extension of commercial fruit-growing, so as to be able to supply the needs of the country with German fruit.

With the increased population and the greater prosperity of the country, more attention is paid to the hygienic principles which are the foundations of good health and longevity. Fruit and vegetables are necessary to health and are, at the same time, agreeable articles of diet.

I. — The most important work of the German pomologist and fruit grower has been in the past, and still continues to be, the careful selection and widespread propagation of the best kinds of fruit among the great and overwhelming number of varieties grown in the country. This selection has been often repeated in the course of time in the various fruit-growing districts on account of the great differences in climate and soil.

The varieties of apples and pears given later are placed in the order in which they most usually occur in the 34 local lists (1) of fruit culture in Germany.

Apples: Boskoop Beauty, Golden-Pearmain, Landsberger Reine, Baumann's Reinette, Charlamowski, Gravenstein, Boiken, Gellert's Cardinal, Prince, Dantziger Kant (Calville de Dantzig), Ribston Red, Roter Eisler, Grosse Casseler Reinette, Grosser Bohnapfel, Gelber Renet, Cox's Orange Reinette, Weisser Klarapfel, Apfel aus Cronach, Bismarck, Manks, Adersleber Calville, Reinette de Canada, Dr. Alexander.

Pears: Louise Bonne d'Avranches, Williams Bon Chrétien, Diel, Bonne Grise, Fondante de Charnay, Poire Pastorale, Calabasse, Grosser Katzenkopf, Napoleon's Butterbirne, Nouveau Poiteau, Jos von Mecheln, Gellert's Butterbirne, Madeleine d'Été Verte, Amant's Butterbirne, Forelle d'Hiver, Pierre Pépin, Muscateller, von Tonge, Anné de Juillet, Dr. Jules Guyot, Blumenbach's Butterbirne, Ljebbing, Beurré Clairgeau, Hardenpont's Winter Butterbirne, Dechantsbirne, Duchesse d'Angoulême.

(1) Lists of standard varieties to be encouraged in different fruit-growing regions.

sides these varieties, there are a number of newer varieties which have been generally tested and also many excellent so-called local varieties which are widely grown.

— During the last ten years, following the example of the German Growers' Union at Eisenach, yearly courses have been started for the education of those who are to become promoters and teachers of fruit-growing in Germany. The lectures are given by practical and well-known grower-scientists, who give an account of their own experiences in the art of fruit-growing, the fruit trade and the utilization of fruit. In these courses, while individual views are not disregarded, unity of teaching is maintained, and in order to avoid contradictory instructions, a certain scheme of instruction is adopted. Simple uniform methods, which are most profit to the fruit-grower, are always advocated in these

far as possible, practical fruit-growers and scientific men lecture alternately. The courses are held regularly every year at places which offer facilities to the students to visit instructive and interesting fruit gardens, fruit-preserving factories, etc.

The subjects of the last course of lectures of the German Fruit-Growers' Union were: The Decrees and Work of the Chamber of Agriculture for the Promotion of Fruit Growing and the Fruit Trade. The Organization of Fruit Associations. — Study of Soils. — The Science of Working and Managing Soils. — Plant Anatomy and Physiology. — The Structure and Physiological Nature of the Soil. — Food and Manure Requirements of Fruit Trees. — Chemical Manures. — Climatic Conditions for Fruit Growing. — Care of the Food-Supplying Organs of the Fruit Tree. — Fruit Physiology. — Soil Bacteria and their Relation to Fruit Growing and Manure. — New Methods of Soil Aeration. — Watering Fruit Trees. — Utilization of Fruit and Vegetables: Scientific Basis of the Different Methods of Treating Fruit and Vegetables. — Growing Vegetables for Preserving Factories. — The Best Fruit Varieties for the Preserving Industry in Cultivation. — Preliminary Preserving of the Different Fruits for Use in Factories for Fruit Preserves, Jams, Fruit Syrups, Jelly, Fruit Cheeses. — The Manufacture of Fruit Preserves. — Judging and Grading Fruits and Vegetables according to the Legal Requirements. — Legal Decisions hitherto in Force. — Potato Drying Plant — and its Use in the Manufacture of Preserved Fruit and Vegetables. — The Composition of Water upon the Keeping of Preserves Boiled. — Forestry Schools: The Development of German Forestry Schools and their Influence on Fruit-Growing in Germany. — The Best Soils and the Most Economical Methods for Tree Nurseries. — Working the Soil in Fruit Nurseries and Fruit Plantations: Use of Cultivators and other Machines in Nursery Work. — Suitable Distribution of Nurseries. — The Growing and the Most Widely Used Stocks. — Best Grafts and the Time for Grafting.

Each lecture is always followed by a discussion. The reports of the courses are published by the Ministry of the Interior in the *Berichten über*

Landwirtschaft under the title "Mesasures for the Promotion of Fruit Culture and of Fruit Utilization."

III. — Tours of instruction are made every year conducted by experienced men with a practical knowledge of the subject; German and foreign fruit farms are visited. The members are required to give an account of their observations and experiences. A selection of the most important facts is published.

IV. — Service of Information Concerning Fruit: In no other branch of agriculture do the prices for products of the same value vary so much in different districts as in fruit-growing. For this reason, a Service of Information has been established throughout Germany, which gives all interested, from the flowering time till the gathering of the crop, information regarding the market prices and all important matters in the different fruit-growing districts of Germany. The Central Station of Fruit Information Service is the German Fruit-growers' Union at Eisenach, which by means of its weekly gratuitous Report of the fruit-market disseminates the accurate information supplied by about 130 reporters in 120 centres of information respecting the price of fruit and vegetable, fruit supply, natural phenomena affecting the crops and prices, and the general condition of the market. The Chambers of Agriculture and Fruit-Growers' Federations also publish similar reports which, however, confine themselves to giving information respecting their own district work.

V. — The surest basis for the fruit trade is careful picking and grading and the right packing of the produce. Practical courses of instruction on these subjects are held every year in Germany, both for men and women.

VI. — Markets of specimen produce are very common in Germany, where not only the finest dessert fruit is sold, but also good, sound, and useful fruit for the working people.

VII. — Courses of instruction and apparatus for preserving fruit and vegetables are conducted by experienced teachers; women are now employed in this work.

VIII. — The improvement and grafting of the different varieties of fruit is actively promoted in Germany by:

a) The careful choice of good, healthy trees producing a large quantity of fine fruit, to serve as stock for the supply of scions and slips.

b) The recent breeding of improved German varieties of fruit. These I may mention: *Apples*: Berlepsch Gold Reinette; Minister von Lamsdorf, an improvement on Landsberger Reinette; Adersleber Calville, a cross between Calville d'Hiver and Gravensteiner, von Zuccalmuhl's Reinette; Ernst Bosch. *Plums*: Bühler Frühzwetsche. *Gooseberries*: Neuweid Earliest; Hönings Earliest. *Strawberries*: Sieger; Deutsch Earliest. The following rules and prescriptions for raising new German varieties have been drawn up at a meeting of Pomologists and noted breeders of new varieties of fruit, which was held at Eisenach.

a) Extensive scientific investigations must be made on the question of the weakening of fruit trees with age,

The deterioration of old varieties makes the breeding of better ones imperative.

The most widely grown varieties of fruit must be improved by cuttings for grafting only from the best trees.

It is important to aim at producing:

among *apples*: strong-growing, healthy varieties, producing very crops of market fruit — productive varieties ripening in August, large, highly-coloured fruit — productive varieties ripening in September and October, with fairly large fruit of fine quality — productive varieties with fairly large fancy-grade fruit for winter table use — late-ripening, heavy-cropping, moderate-sized household and dessert varieties — heavy-cropping varieties resistant to woolly aphis — upright, rosette varieties, with fruit not highly coloured, for roadside planting.

among *pears*: varieties ripening in August, good, heavy-croppers, with large fruit — large, heavy-cropping, extra-fine, coloured varieties, sound on the tree — suitable for winter dessert — heavy-cropping varieties, suitable for preserving especially whole.

cherries: fine heavy-cropping Morellos for preserving.

plums: heavy-cropping and early-ripening varieties, giving fine, large fruit — good, heavy-cropping plums and damsons of moderate size, really good for preserving, drying and jam-making.

stone fruits: hardy, heavy-cropping, early varieties coming true from seed, with large fruit easily separating from the stone — hardy, heavy-cropping varieties, with fine and white-fleshed fruit easily separating from the stone — suitable for preserving. — hardy, heavy-cropping mid-early ripening varieties with the flesh readily separating from the stone.

peaches: heavy-cropping varieties with firm yellow flesh, suitable for preserving.

gooseberries: varieties resistant to American Gooseberry Mildew.

currants: seedless varieties.

strawberries: ever-bearing, large-fruited varieties.

The breeding of varieties which come true from seed.

The popularisation of the best methods of pollination, so as to increase crossing.

Improvement of wild stocks and of varieties suitable for interbreeding. At the invitation of the German Fruit-Growers' Union, many Horticultural Schools and Model Gardens and certain pomologists and fruit-breeders are taking part in this work.

The obtaining of legal protection for new selected varieties of

— The increased supply of the best varieties of dessert fruit is one of the chief features of the recent development of fruit-growing in Germany. The production of fruit of fine quality has made extraordinary progress during the last decade. The first place as regards yield is taken by bush apples on Paradise. In comparison with the standard tree it is of course shorter-lived and is more particular as to soil and atmosphere — also it does not stand under-crops of bush fruit and vegetables as

well as the former. But on the other hand, it fruits much earlier, larger crops and pays better, because more trees can be grown on the area and its fruit is much finer and more perfect in shape and thus fetches a higher price. It is chiefly apples and peaches which are grown in this form.

The commercial growing of fruit, especially of the finest highest dessert fruit, can only be practised in districts where the natural conditions are especially favourable for fruit-growing in general and for some species or variety in particular. We already possess in Germany a number of such fruit-growing districts, *viz.* for early plums: Bühl in Bavaria; Palatinate; for cherries: Thuringia, Baden, Werder, Guben; the Alte Land near Hamburg; for small fruit: the Vorgebirge and Landen near Hamburg; for pears and apples: most of the German fruit-growing districts; for peaches: the Rhineland, the Palatinate, Saxony. The whole of South and Central Germany where there are favourable positions to be had.

X. — The system of intercalary crops is steadily increasing in Germany. Fruit-growing, and their utility and advantage to the fruit trade is increasing. For intercalary and under crops the following are currants, strawberries, raspberries, gooseberries, various kinds of vegetables, chiefly beans, and also tomatoes and lilies-of-the-valley to be sold by post. Experienced and successful fruit-growers reckon to make an average net profit of £ 10 per acre, not including the fruit borne by the fruit trees under and between which the other crops have been grown. In these crops, under favourable circumstances, bring in twice or three times the profit stated above.

XI. — Fruit-growing on the railway embankments is continuing to increase. A measure and example of this is given by the fact that in 1909 94 000 fruit trees were planted in the Kingdom of Bavaria alone: 40 000 apples, 14 000 pears, 28 000 plums, 7 000 cherries, 3 000 peaches and apricots, 2 000 walnuts and hazels and 200 quinces. Up to 1909, about a quarter of a million fruit trees had been planted on railway embankments in Germany, of which the great number (three-quarters) were apple trees, the rest being pears, plums, cherries, morellos. The shape most used is the half standard, but both standards and bushes have been planted.

XII. — Cold storage depots for keeping fruit fresh for a long time and a suitable opportunity occurs for its sale, have been established under the control and assistance of the German Fruit-Growers' Union. In this manner there is no necessity for the fruit market to be glutted at the time the crop ripens and for the produce to be sold at prices far below its value and these establishments have been of the greatest service to the growers in sharing in them.

XIII. — The domestic utilization of fruit and the promotion of fruit-growing by instruction courses held in the different fruit-growing districts of Germany by competent teachers of fruit culture, (many of whom of late have been women) is continually on the increase. An attempt

to bring forward the domestic side more than had hitherto been and only such work is attempted as can be accomplished cheaply with simple appliances, and which provides in a short time large quantities of tasty, well-preserved fruit and vegetables. The following are the fruits treated: jam-making — preparation of cheeses and jellies — making of fruit wines — bottling and canning of fruit — fruit drying — manufacture of non-alcoholic beverages, such as fruit wines and syrups. The manufacture of the above preserves in factories increases every year in Germany; thus, factories, have been started with a plant capable of dealing with 50 tons of asparagus daily.

IV. — Model fruit gardens, laid out by officials and Corporate Boards by the State and the provinces, have determined to give up growing different varieties of fruit and paying attention to the cultivation of fruit in special forms, and to become experimental fruit plantations. They aim at:

- a) Discovering, by means of experiments in cultivating different varieties, those kinds of fruit which appear best suited for growing in the district served by the model garden and the production of grafts from the most suitable trees.
- b) The right naming of widely-grown varieties of fruit, which are wrongly named, or have various different names.
- c) Testing the different stocks; the right distance apart for planting; the most suitable shape for the various species and varieties of fruit; demonstrations with undercrops as demonstrations for commercial fruit-growers and farmers.
- d) Manuring experiments with different chemicals in order to determine the best and the most efficacious amount to be used.
- e) The control of enemies; testing control methods.
- f) Amateur fruit-growing for the purpose of discovering the best varieties for the most varied purposes.

The model gardens are open to all seekers after information. Courses of instruction for fruit-growers and assistants are always being held on management, and the treatment, gathering, packing and utilization of fruit.

IV. — The fruit shows during the last ten years have been arranged in a way with a view to the encouragement of commercial fruit-growing and of raising Germany with home-grown produce.

Instead of the assortments of fruit of large size and exhibits of only 6 specimens, which only benefited exhibitors of the most numerous varieties without any regard to the value of the fruit, the exhibitor is now required to furnish a ton or more of the produce of the few best varieties. To attain this end, the programmes of the German fruit exhibitions include competitions for the best and finest fruits of certain prescribed varieties in order to show the perfection attained by the German fruit-grower of dessert fruit. Prizes are also offered for other things, e. g.: the presentation of the kind of fruit culture practised by the exhibitor or by the fruit-growing district or province. Further, the exhibition of

Grading of Fruit by Size in Germany.

	Fancy	Grade I	Grade II
<i>Apples.</i>			
Class I { Weight of each fruit	over 250 gr. (9 oz.)	180-250 gr. ($6\frac{1}{2}$ -9 oz.)	120-180 gr. ($4\frac{1}{4}$ - $6\frac{1}{2}$ oz.)
{ Number of fruits to 50 kg. (110 lbs.).	not over 200	200-275	275-400
Class II { Weight of each fruit	over 200 gr. ($7\frac{1}{4}$ oz.)	150-200 gr. ($5\frac{1}{2}$ - $7\frac{1}{4}$ oz.)	100-150 gr. ($3\frac{1}{2}$ - $5\frac{1}{2}$ oz.)
{ Number of fruits to 50 kg. (110 lbs.).	not over 250	250-330	330-500
Class III { Weight of each fruit	over 180 gr. ($6\frac{1}{2}$ oz.)	120-180 gr. ($4\frac{1}{4}$ - $6\frac{1}{2}$ oz.)	80-120 gr. ($2\frac{9}{16}$ - $4\frac{1}{4}$ oz.)
{ Number of fruits to 50 kg. (110 lbs.).	not over 275	275-400	400-600
Class IV { Weight of each fruit	over 150 gr. ($5\frac{1}{2}$ oz.)	100-150 gr. ($3\frac{1}{2}$ - $5\frac{1}{2}$ oz.)	60-100 gr. ($2\frac{3}{4}$ oz.)
{ Number of fruits to 50 kg. (110 lbs.).	not over 330	330-500	500-800
<i>Pears.</i>			
Class I { Weight of each fruit	over 250 gr. (9 oz.)	180-250 gr. ($6\frac{1}{2}$ -9 oz.)	120-180 gr. ($4\frac{1}{4}$ - $6\frac{1}{2}$ oz.)
{ Number of fruits to 50 kg. (110 lbs.).	not over 200	200-275	275-400
Class II { Weight of each fruit	over 200 gr. ($7\frac{1}{4}$ oz.)	150-200 gr. ($5\frac{1}{2}$ - $7\frac{1}{4}$ oz.)	100-150 gr. ($3\frac{1}{2}$ - $5\frac{1}{2}$ oz.)
{ Number of fruits to 50 kg. (110 lbs.).	not over 250	250-330	330-500
{ Weight of each fruit	over 140 gr. ($5\frac{1}{4}$ oz.)	110-150 gr. ($3\frac{1}{2}$ - $5\frac{1}{2}$ oz.)	60-100 gr. ($2\frac{3}{4}$ oz.)

varieties, packed for the market, as are most suitable for given districts of greatest commercial value.

I. — The interests of fruit-growing in Germany are promoted also by new systems introduced by the German Fruit-growers' Union, each: a uniform method of labelling and a uniform grading accordance for the whole of Germany. Thus, the most valuable economic classes of apples are divided into early-ripening or summer varieties (Nos. 1-15), autumn varieties (Nos. 16-40) and winter varieties (Nos. 41-100) and are similarly divided.

A uniform method of grading by size leads to a universally recognized scale which is recognized also in the Law Courts in cases of

disputes. The accompanying table gives details. It is important that only the number of fruit should go to the 50 kg. weight. In the case of fruits in the south (oranges, lemons, etc.) it has long been the trade custom to estimate the value and quality of the fruit by the number to 50 kg. A certain latitude is necessary regarding the weight and number of the different grades: this has been given in the table.

II. — Much progress has been made in fruit-growing in Germany; the following may be mentioned: new measures for controlling diseases of fruit trees; legal enactments for the protection of fruit trees; experiments in using fruit trees with chemicals in order to ascertain the best kinds of fruit; experimental planting to determine the most suitable special varieties of trees for permanent cultivation; the careful selection (reference to books of control and yield) of the best trees to supply slips raising inferior varieties.

This subject together with others which could not be treated at length within the limits of this article, is dealt with in many of the publications of the German Fruit-Growers' Union (Deutscher Pomologen Verein) at Berlin, which may be obtained on application by those interested in the

industry. In the last few years past, many millions of young well-grown fruit trees of the best selected varieties have been planted in Germany. The favourable climate of that country, the excellent management of the trees and the beauty of the fruit, the flavour of the produce place German fruit culture in the first rank. Supported by scientific men and by the merchant class, numerous well-trained officials, inspectors and fruit growers are occupied in turning to account all the latest knowledge which may serve to promote fruit cultivation.

The Manufacture of Butter and Cheese with Culture Starters in Italy

by

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The use of culture starters in the preparation of butter and cheese in Italy dates respectively from the years 1895 and 1903.

Butter. — In the summer of 1895 the late Prof. Giuseppe Sartori, I, were at Copenhagen, encouraged by the Minister of Agriculture, to study the Danish method of butter making with selected starters. This method, as is well known, consists in pasteurizing the cream with the object of killing or paralyzing the natural germs, which may be good or bad, and then adding a pure culture of certain determined ferment which were shown in 1890 by Prof. Vincent Storch of the Agricultural Station of Copenhagen to be the specific agents in the ripening of cream.

In this manner the factors of chance and empiricism were eliminated from the process of the souring of cream, which with the old method used to take place naturally during the rising of the cream according to our methods, or was artificially brought about in centrifugated cream by the addition of sour buttermilk or of some other empirical starter, which was customary in the North of Europe.

On our return to Italy we hastened to divulge the salutary reform, which was chiefly interested from the scientific point of view, emphasizing the hygienic and bacteriological significance of the process, in lectures held at the Agricultural Association of Lombardy, at the Athenaeum of Brescia, and at the Royal Italian Society of Hygiene. Sartori, who studied the question in its technical aspect, actively set to work to describe the practical execution of the new method in reports to the Minister, to experiment it in the dairy of the Royal Agricultural School of Brescia, and to teach it and to spread it amongst producers by means of lectures, and verbal and printed instructions. And already in 1897 he was able to announce that the reform had been definitively adopted by several dairies (1).

The Ministry of Agriculture began to favour the propaganda by subsidies and by means of special competitions for butter prepared with culture starters (Lodi 1898, Milan 1906, Turin 1911).

(1) See *Bollettino Ufficiale del Ministero di Agricoltura*, Rome 1897.

(Author's note.)

The first to adopt the new process were the great dairies of the district of which the firms Antonio Zazzera of Codogno, Polenghi Lomello of Lodi and Codogno and Locatè Triulzi near Milan occupy most important positions. The example of these was soon followed by other firms, especially of Lower Lombardy (Mangiarotti of Lomello, Gallone of Milan, Celli Majno of Mortara, etc.). In fact this region produces more butter than any other milk-producing district of Northern Italy; it is here that, owing to the distribution of landed property and to the favourable topographical conditions it is possible to collect the large quantities of milk necessary to the creation of great industrial establishments like those of Fiorano, Somaglia, Acquanegra, Olmeneta, Secugnago, Sant'Angelo Lodigiano, Melegnano, Casalpusterleno, Offanengo, Rogoredo, Abbiategrasso, Borgosatollo, Soresina, Casalbuttano, etc. All these are localities in which important dairies were founded either independently or through the aid of houses of other firms, and in all of which the Danish method of butter-making was adopted.

At the same time other regions of Italy, such as Piedmont, Emilia, Liguria, Friuli, Liguria are not without examples of large dairies in which selected butter starters are used, if not continuously at least intermittently when required and according to demand; their number is constantly increasing. Quite recently a large Piedmontese dairy, Barberis Bonetta, has, with my assistance, adopted culture starters.

It is not an easy task to ascertain the quantity of butter made according to the Danish system in Italy, as industrial firms do not like to give publicity to their affairs, partly through fear of heavier taxation. It can, however, be approximately deduced from the statistics of exports, showing that the butter exported, about 78,700 cwt. per annum, is made with culture starters. It is, however, to be noted that a portion of the butter exported, especially that for the French Riviera, is still made from cream allowed to rise and ripen naturally, while on the other hand butter made on the Danish system is demanded also by the home market, thus proving the increasing recognition of the advantages offered by the new method.

As is well known, these advantages may be summarized as follows: delicate aroma, greater constancy of type and improved keeping qualities. Of these the most generally recognised are the two latter and especially the last, namely the greater resistance to turning rancid. In this resistance the greatest stress is laid in judging butters in shows and competitions. As for the aroma, the same observation has been made also abroad, especially in France. There are some farms in which butter made in the old way turns out more sweetly scented than by the Danish method. Whether this depends upon special natural aromas or upon special breeds of aroma-producing bacteria, both of which are destroyed by pasteurizing the cream and cannot be developed or replaced by the selected starters now in use, is a question requiring further study. However it must not be forgotten that the development of the taste of butter made on the Danish lines is always slower than in butters made

in the old way, and that on the other hand the unsatisfactory results of the Danish method are frequently due to the negligent and improper way of applying it. Some dairies which had abandoned it have returned to it after having introduced some opportune modification either in the pasteurizing process, or in the multiplication and choice of the ferment or in the inoculation, incubation and acidification of the cream. For the original cultures used in Italy, they come almost exclusively from abroad. Among the firms patronized, Blauenfeldt and Tvede of Copenhagen, Hansen also of Copenhagen and H. Berend and Co. of Wildeshausen deserve to be mentioned. Regarding the multiplication of the ferment and the ripening of the cream, it is not easy to know the methods adopted by the different dairies, as these like to keep to themselves their technical details which often contain the secret of their success. Besides, it is obvious that exactly the same rules cannot be followed in all cases, especially as the demands of the customers in the matter of the degree of acidity of the butter have to be complied with.

But if there may still exist some uncertainty and some exceptions concerning the delicacy and pleasantness of the taste, in the method, amount, purity and constancy of the flavour the superiority of the method made on the Danish system is being always more firmly established. This is demonstrated by the facts that the home consumption of butter made with culture starters is on the increase, and that the system is utilized for the improvement of butters destitute of taste, as is the case sometimes in winter, or of second rate butters such as whey butter, especially when this is a by-product of the making of cheese resembling milk cheese. In this case the cream acquires an unpleasant taste and one which can be attenuated, if not removed altogether only by pasteurization and by the addition of a good culture starter. In other words the use of culture starters is constantly gaining favour as a means of improving naturally inferior butters and raising them to the level of good butter.

Cheese. — In 1903, under the presidency of Senator Giulio Vignani an Association among cheese producers and traders was formed in Milan with the object of experimenting practically the methods proposed here for the improved manufacture of cheese.

This method is based upon the same principles as those upon which the Danish method of butter making is founded; that is, using a ferment which is bacteriologically pure and to which pure cultures of good acid ferments have been added. Here, however, the task is more difficult for the two following reasons: in the first place for the purification of the milk, pasteurization cannot be relied upon in an absolute manner, as it having been shown that the temperature to which milk must be heated so as to kill all the germs it may contain is injurious to its proper ripening for cheese making: secondly, because while the ripening of cream is after all only a mere acidification, is very simple, the ripening of cheese is a very complex process of which we are still far from knowing all the factors and all the biochemical products.

vertheless my scientific and practical investigations had put me in possession of facts that seemed to me to be of immediate practical application for the improvement of the manufacture of at least the hardest curd cheeses, the making of which as well as the micro-flora accompanies their ripening being much simpler than in the case of soft cheeses. These facts may be summarized as follows :

1) By means of opportune hygienic measures which can be carried out in practice, it is possible, without having recourse to pasteurization, to obtain a milk relatively free from bacteria, and sufficiently so to allow the useful addition of selected ferments. These measures must be taken so that is by preventing the contamination of the milk (devoting attention to the feeding, to the cleanliness of the cows and especially of the milkers, to clean milking etc), and they must be completed by preventing multiplication of the bacteria in the milk (cooling and protecting it up to the moment of working it up).

2) The present knowledge on the ripening agents of cooked-curd cheeses is sufficient to allow of the substitution of the empirical ferments used in cheese making (fermented whey, fermented milk, etc.) by pure cultures of certain ferments. Provided that in the choice of ferments the following scientific and practical facts relative to the making and ripening of these cheeses be borne in mind : a) that in these cheeses a rapid lactic acid fermentation takes place without production of gas and accompanied by no other processes. b) that their cooking temperature attains 50° C and upwards. Consequently the bacteria to be chosen must be from good cheeses, and must possess the following general physiological requisites : they must be lactic ferments not producing gas, energetic, and resistant to heat.

3. The use of selected ferments requires processes favourable to them. For this object it is necessary : a) to consider the most favourable conditions of temperature, moisture, etc., for their development and action ; b) to avoid every kind of empirical starter and of impure rennet that may hinder the action of the culture starters ; c) to abstain from all those conditions, such as the use of too high temperatures, of an excessive acidity and of antiseptics which tend to control harmful germs at the same time prove injurious to the useful ones.

Working on the above lines, the Association began in 1903 at the cheese factory near Milan to use culture starters in the preparation of the classical Italian cheese, *Parmesan* or *Grana*. From the very beginning success attended the new departure, so that already in 1906 at the Milan International Exhibition three year-old ripe experimental cheeses could be presented together with the control cheeses, and they received completely favourable judgment from two international juries. The authoritative "Milkzeitung" of Leipzig (1) said that it was the opinion of a Commission of international experts could verify the results

(1) Year 1907, No. 9.

obtained, with rigorously experimental methods, by selected key and convince itself of the possibility of exerting a favourable action on the quality of the cheeses made by introducing culture starters into technical use. Encouraged by the good results obtained with Parmesan, Lombard type (Lodigiano) and of the Emilian type (Reggiano), the Association turned its attention to other types of hard cheeses, such as the Valtellina (Bitto), of the Bergamo district (Branai), of the Friuli (Tasio), the cacio cavallo, the Swiss cheeses (Fribourg and Emmentaler), margarine cheeses, and with all of them obtained further confirmation of the value of the method.

All who have tried and adopted it bear witness to the following advantages: 1) considerable reduction in the number of defective cheeses; 2) greater uniformity of characters; 3) improvement in the most essential qualities (eyes, softness, flavour); 4) improved keeping quality.

In 1905 the Association resolved to found a cooperative bacteriological laboratory, under my direction, for the preparation of selections, in order to supply them to both members and non-members at cost price and in the case of scientific institutions, travelling lecturers of agriculture, etc., at reduced prices and even gratis.

By means of lectures, communications to national and international congresses, of exhibits at shows and competitions, and of advice personally, or by printed leaflets, the modern principles of cheese-making founded on bacteriology and on hygiene were spread throughout the country. The results of researches and of experiments embodied in reports are published in the Official Bulletin (1904 and following years) the Ministry of Agriculture (which grants a subsidy to the Association). So that now it may be said that the knowledge concerning culture starters and their use has become public property.

In the last seven years (1906-1912) 56 629 doses of culture starters each sufficient for 110 gallons of milk, were distributed. The figures for several years are as follows: 1906, 2276; 1907, 6449; 1908, 6261; 1909, 6564; 1910, 12114; 1911, 11609; 1912, 11356. The decrease of the two last years is due partly to the smaller quantity of milk treated by consumers on account either of the rise in the price of milk or of the foot-and-mouth disease, and partly to the fact that some of the usual consumers suspended the manufacture of cheese in favour of the preparation of condensed and sterilized milk. Among the constant consumers of culture starters several of the best and most conscientious cheese makers and the principal industrial dairies are to be found (1).

Whilst at the Milan International Exhibition of 1906 the only cheeses made with culture starters were those of the above mentioned Association, at the Jubilee Exhibition at Turin in 1911 several cheeses made with

(1) GORINI. *Rendiconti del Reale Istituto Lombardo di Scienze e Lettere*, Milano, p. 863.

were shown, also in the exhibits of the Province of Reggio at a
of cheese manufacturers and others interested in cheese, promoted
Association in March 1912 at Milan, and to which twelve travelling
ships, the Italian Association of members of the industry and trade
products, the National Union of Social Dairies, as well as numerous
rural Societies, Chambers of Commerce, Provincial Councils, Agri-
banks, professors of dairying, agricultural members of the Chamber
ties and of the Senate, etc, had adhered, a resolution was adopted
ending agriculturists and the manufacturers of cheese to follow
lines of cheese making based on the union of hygienic conditions
dairy with selected ferments.

are therefore fully justified in affirming that the improved modern
of cheese making is now firmly established in Italy, not only in
rural institutions and schools of dairying, but also in agricultural
practical practice.

SECOND PART. ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

330 - Italian Law for the Protection and Increase of the Productive Live Stock in the Country.

Legge italiana per la tutela e l'incremento della produzione zootecnica nazionale
Gazzetta Ufficiale del Regno d'Italia, Year 1912, No. 190, August 12, 1912; Year
No 12, pp. 331-332, January 16, 1913. Rome.

The Royal Decree No. 1395, dated December 19, 1912, approves Regulations for the execution of the Law No. 832 of July 6, 1912, concerning measures for the protection and for the increase of the production of animal husbandry in the country.

According to this law "The number of stallions in the State will be raised in five fiscal years to 1200. For this purpose the following sums are set apart for increasing the appropriations for this item:

1912-1913	£ 25 376	1915-1916	£ 44 409
1913-1914	£ 31 721	1916-1917	£ 50 753
1914-1914	£ 38 065		

In the selection of the stallions to be purchased special attention will be paid to the need of producing artillery horses (art. 1).

"In the budget of the Ministry of Agriculture, Industry and Commerce, beginning with the year 1912-1913, the sum of £ 7930 will be devoted to increase the appropriations for the following: Encouragement of the production of horses (prizes for stallions and brood mares; subventions for the purchase of breeding animals; sale of stallions at reduced prices; prizes at races) and encouragement for the production of mules (breeding of asses; concession of donkey stallions; subventions for the establishment and working of stations of donkey stallions; prizes to breeders)." (Art. 2).

With the object of increasing and improving the breeding of cattle, pigs and poultry the Minister of Agriculture, Industry and Com-

-) Promotes the establishment of bull, ram and boar stations and subsidizes them, granting also breeding animals.
-) Subsidizes the importation of breeding animals of improved

Grants prizes to those breeders who, uniting in associations, establish special farms for the raising of calves on mountain pastures or in appropriated localities.

-) Organises directly: 1) prize shows for breeding animals, and also those shows that are organised by local bodies or committees; competitions for the cultivation of forage plants and for the efficient feeding of live stock, and subsidizes those promoted by local
- 2) prize competitions for the use of motors to replace animals in agricultural machines and implements.

) Promotes and subsidizes exhibitions of animals for the butcher.

Favours the development of mutual insurance associations against fire in live stock, and of dairy associations and of their unions or syndicates, facilitating their establishment and their operations, by making contributions in money and by rewarding with prizes the best and most efficient ones.

-) Promotes and subsidizes the establishment and the working of stations and cooperative societies formed among producers for the organization of general warehouses with annexed markets for wool.
-) Subsidizes the associations of agriculturists formed for carrying out undertakings for the improvement of animal husbandry.

) Founds and subsidizes new institutions for animal husbandry, veterinary stations and depots where their need is recognized, considering the conditions of the different regions in this respect and the contribution of local bodies.

-) Grants contributions for the establishment of animal husbandry stations attached to the travelling agricultural lectureships.

4) Promotes and encourages by means of lectures, temporary exhibitions, scholarships, and in other ways, the propaganda in favour of the intensification of the yield of animal husbandry." (Art. 3).

Upon every head of cattle that is slaughtered before its first permanent incisor is complete, a tax of 2 Lire (about 1s 7d) is levied by the commune. Of the sum thus raised one quarter is left to the commune and the rest devolves to the State" which devotes it to the objects mentioned in art. 3 of the present law. (Art. 4).

Institution of a General Inspectorship of Agriculture in Tunis.

Institution d'une Inspection Générale de l'Agriculture en Tunisie. — Journal Officiel de Tunisie, Year 31, No. 14, p. 198. Tunis, February 15, 1912.

By decree of February 13, 1913, a General Inspectorship of agriculture for the technical agricultural services has been founded at the

General Direction of Agriculture, Commerce and Colonization.
 Director General of Agriculture is charged with the execution of a decree.

332 - Agriculture in the Gold Coast.

Colonial Reports, Annual, No. 725: Gold Coast, Report for 1911, pp. 49. London.

Agricultural Exports. — The total value of all seaborne exports of the Colony during 1911 amounted to £3,792,454 against £2,697,706 in 1910. The agricultural exports in 1911 were as follows:

	Quantity	Value £
Cocoa	88,987,324 lbs.	1,613,468
Cola Nuts	5,791,931 "	93,099
Copra	779 tons	13,257
Cotton, raw	9,701 lbs.	238
Concentrates	1,064,456 "	13,924
Guinea Grains	99,386 "	2,909
Gum Copal	80,042 "	1,110
Ivory	1,607 "	385
Lumber (Native timber)	13,973,396 sup. ft.	138,821
Palm Kernels	13,254 tons	173,891
Palm Oil	1,610,209 galls.	128,916
Rubber	2,668,667 lbs.	219,447

The most notable increases in the value of exports are: rubber (£746,897), cola (£15,383); and the most notable decreases are: palm oil (£139,429), palm kernels (£32,472). The cause of the decrease in the value of palm oil is assigned to the fall in prices in the European markets; the fall in the value of palm kernels is explained by the attraction held out to the natives by the more easily won profits of the cocoa industry.

Lands — The bulk of land in the Colony belongs to the "stools", and theoretically there is no land without an owner. The Crown possesses no waste land in the Colony, but certain lands have been acquired by the Government from time to time, mostly under provisions of the Public Lands Ordinance, 1876, which legalises compulsory acquisition for the services of the Colony on payment of reasonable compensation. Of recent years deeds have come into common use, especially in land transactions between natives and Europeans.

Agriculture. — Agriculture is the staple industry of the Colony. The chief food crops are yam, cassava, maize, amankani (a species of eddo), and plantain. The most important cultivated product grown for export is cocoa. The industry is almost entirely in the hands of the native farmers. Agricultural stations in charge of European curators have been established at Aburi, Tarquah, and Assuantsi in the Colony, at Coom in Ashanti, and at Tamale in the Northern Territories. European native instructors under the control of the Director of Agriculture

ntly travelling and advising the native farmers as to the cultivation and preparation of the various products of the soil.

ports on the following subjects were furnished by the Imperial te to the Government of the Gold Coast during 1911. A sample usaland Upland cotton grown at Labolabo was of good quality, gh rather uneven in strength. Recommendations were made regard- e acclimatation of this cotton in the Gold Coast. A sample of cotton from the Dagomba District of the Northern Territories e excellent colour but somewhat harsh and rather short. Three s of imperfectly prepared Hibiscus fibre were received from Ta- These fibres would be saleable as substitutes for jute, but they erior to the latter fibre on account of their interlacing character. cal specimens of the plants yielding these fibres were identified e as *Hibiscus sabdariffa* L. *H. cannabinus* L., and *H. squamosus*

sample of Funtumia biscuit rubber prepared with formaldehyde ed a little more resin and protein than is desirable, but was other- f good quality, and was valued at 6s. 10d. to 7s. per lb. in London me hard Para at 6s. 11d. per lb. Samples of the roots and stems e gutta-yielding plants were examined, but only one of them con- sufficient gutta to make extraction on a commercial scale worth eration. The roots and stem of this plant contained respectively and 2.10 per cent. of gutta.

ve samples of cocoa which had been prepared by different me- were received for valuation; the fermented cocoa was regarded as r to the unfermented samples (1).

mples of cola nuts derived from *Cola acuminata*, *C. Johnsonii* and *Wollata* were found to contain respectively 2.1, 0.8, and 0.8 per of total alkaloid, expressed on the dried nuts. This sample of *minata* is remarkable in containing a high percentage of caffeine. otanical specimens of the plant yielding "Baco" or "Abaku" vere identified at Kew as *Dumoria heckeli*, A. Chev.

Agriculture in Indo-China in 1911.

griculture en Indo-Chine en 1911. — Ministère de l'Agriculture, Direction de l'Agri- , Bulletin mensuel de l'Office de Renseignements agricoles, Nos. 11 and 12, pp. 1493- 9 and 1715-1727. Paris, November-December 1912.

Cochin-China. — Over a large extent of this country, rice, which chief crop grown, depends on the rain for its irrigation; in conse- e, years or irregular rainfall of with prolonged periods of drought in poor harvests or famines (2). In the provinces of Bacieu and ia, where the soil is very fertile, but consists of recent alluvium thus only productive if the rainfall is regular and abundant), the

See No. 1301, B. Sep. 1912.
See No. 1612, B. Dec. 1912.

(Ed.).
(Ed.).

network of irrigation canals, already very extensive, is being gradually increased, although slowly owing to the laborious nature of the work. When these irrigation works are finished a vast tract of land will be turned to account.

Owing to the uncertainty of the rice yield, the natives are turning their attention more and more to growing other crops. Plantations of maize, sugar cane and fruit trees are constantly increasing, especially in the east of Cochinchina; maize has also been grown successfully in the province of Chandoc. The plantations of pineapples, sugar cane, mangoes, areca nuts and mangoes in the province of Thudaumot produce an abundance of fruit, which is much appreciated in the markets of Saigon and Cholon, and which is even beginning to be exported to China and Singapore. The sugar cane suffers much from the attacks of the borer larvae; and only yielded a poor crop in 1911. Pepper tree plantations exist on the Hong-Chong and Phuquoc district, as well as in the province of Baria. The following crops are also cultivated in Cochinchina: tobacco, sweet potatoes, haricot beans, vegetables, betel, coffee, manioc, mulberries, earthnuts, etc. In the province of Gocong, an attempt has been made to grow coconuts.

Native colonisation is increasing steadily. In one year 37 000 acres have been granted in concessions between 25 and 1 200 acres, and 1 200 acres in concessions of from 1 200 to 7 500 acres. Some of the provinces are at present entirely under cultivation. The natives are now turning their attention to the immense tracts of uncultivated land situated in the provinces of Rachgia, Bac-lieu, Cantho, and Soctrang.

European colonization, though almost stationary in the western provinces, tends to develop increasingly in the east. In a few months over 75 000 acres of the State land have been sold in the province of Bienhoa alone, for the purpose of making *Hevea* plantations. The plantations of rubber trees belonging to Europeans are over 50 in number and cover 150 000 acres of red land and 34 500 acres of grey land. There are already 830 000 trees on the red land and more than a million on the grey. Ong-yem rubber met with the approval of the judges at the recent exhibition in London and this has given rise to many requests for it.

The future of colonization in Cochinchina chiefly depends on the solution of the labour problem, the local supply being clearly inadequate. By a decree of March 14, 1911, a Commission of planters was appointed to consider suitable means for promoting immigration into Cochinchina and to study the establishment of Colonizing Bureaux.

For the last two years, attempts have been made to remedy the scarcity of labour by the use of agricultural machines (1). Hitherto the results obtained have not been very conclusive, as the tackle employed was too heavy, and sank in as soon as the soil was a bit damp.

(1) See No. 121, B. Feb. 1913.

ary to devise a light type of machine, working a narrower strip
 and. The use of machines requires a dry compact soil; to attain
 excess of water (whether rainwater, or due to tidal floods) must
 prevented and attention paid to hoeing and ploughing, practices
 neglected by the native. An association has lately been formed
 the solution of the question of mechanical cultivation in Coch-

injury done by insects, birds and rats, especially the two last, is
 to be feared. The attempts made to find an efficacious means
 of controlling rats have proved abortive.

The administration continues its measures for the destruction of the
 of plants or "luc binh" (*Eichhornia crassipes*) (1), which threat-
 to prevent the traffic on a large number of the water-ways and
 even invaded the rice-fields at some places. Numerous groins
 along the course of the rivers and canals, caught 235 100 cub.

"luc-binh" in January, 323 200 cub. ft. in February and
 0 cub. ft. in March. The results of this system being so satis-
 fying, it will be generally adopted throughout Cochinchina.

[Tonking. — The Agricultural and Commercial Services have
 increased and reorganized by the decree of April 7, 1910. An at-
 tention is being made to provide the natives with technical instruction,
 ally in reeling and weaving silk, plaiting hats and mats, etc. The
 mental Stations of Than-ba and Phu-lang-thuong distribute selec-
 tion of worm eggs. At the Than-ba Station certain diseases of coffee are
 studied at present, as well as the prevention of ravages caused
 insects, the improvement of native cultivation by means of seed se-
 lect, and the cultivation of maize, rice and sugarcane. At La-pho,
 and oleiferous plants are under investigation, while the Phuxa
 of Agricultural Hydraulics is occupied with the question of
 irrigating rice. The Stock-breeding establishments of Hanoi and Nuoc-hai
 continued breeding native horses and cross-breeds. Horse-breeding
 increased much in the mountainous district. At Hanoi sheep-breed-
 ing practised with much success, some of the animals coming from
 Malay peninsula, others from Java. Where breeders have been pro-
 vided with sheep, e. g. at Sontay, Chobo and Bac-Kant, the animals
 proved to be strong and disease resistant, and to provide good

the exports of rice and maize are on the increase. The cultivation
 of European food plants and fruit trees is also increasing, even far from
 great centres.

The budget of 1911 reserved 156 823 acres of forest, which bring up the
 area of reserved forest land to 337 012 acres. In 1910, 1 493 344 cub.
 timber were felled and 1 725 624 cub. ft. of wood were burnt for

[See No. 1390, B. May 1911; No. 1167, B. Aug. 1912.

(Ed.).

charcoal, as against 1 422 745 cub. ft. and 1 010 172 cub. ft. respectively in 1909.

The irrigation works, begun in 1898, are now extended to the delta. With a view to obtaining precise information as to the gain advantage which can be expected from irrigation, an experimental has been made (in accordance with the provisions of a decree, November 3, 1909) in the districts of Phu-xa and Phu-gia (Ha province). The results hitherto obtained point to the advisability of the diminution of the irrigation coefficient adopted for the Kep, and show that irrigation alone, together with the ordinary native methods of cultivation, is sufficient to produce average crops in districts in which, at certain times of the year, nothing could before be raised, also show that chemical manures, when used on the rice fields cultivated by the natives, do not as a rule give appreciably higher returns.

III. *Annam*. — Tobacco is chiefly grown in the provinces of Thanh-hoa, Vinh and Dong-hoi; cinnamon in Thanh-hoa and Quang-nam (cinnamon becomes increasingly rare); tea is much cultivated in Quang-nam and Binh-dinh, and rubber in the province of Hatinh. The cultivation of coconut palms is encouraged.

In 1911, the total area colonised by Europeans was 97 600 (4 080 acres more than in the preceding year), and the total of the cultivated area was 25 450 acres.

The propagation of *Ficus elastica* has been continued on a large scale; many slips have been taken from young trees raised from seed brought from Saigon; these succeeded perfectly, which was not the case when slips were used from the local Annam variety: this can now be propagated by layers. From May until the end of August, incisions were made in trees of *Ficus elastica* of from 7 to 8 years of age and of an average circumference of 32 inches at a height of 3 ft. 3 in. from the ground. These trees had never been tapped before, and 330 cc. of smoke coagulated rubber per tree was obtained. Acclimatization experiments with Venezuelan Kapok are being successfully prosecuted, especially at the Yendinh Station. This same Station introduced in Kelantan sheep, which have become perfectly acclimatized. The various Annam Experiment Stations distributed from June 1910 to July 1911 296 226 layings of selected silkworm eggs.

IV. *Cambodia*. — The sericultural services is making rapid progress in 1910-11, 121 851 layings of selected silkworm eggs were distributed (more than double the amount distributed in the previous year); the average weight of the native cocoon has increased in seven generations from 643 mgr. to 1 200 mgr.

Rice, pepper, tobacco, maize and cotton are the principal crops; the cultivation of maize is making rapid progress. Stock breeding is one of the chief sources of revenue of the country.

V. *Districts of Kouang-Tchéou-Wan*. — The principal crops are as follows: earthnuts, (increasing very fast — the demand exceeding supply), potatoes, sugar cane, hemp, cotton, mulberries and sweet

which are the chief article of food consumed by the natives. Many are exported, either made into mats and sacks, or in the form of spinning material. Selected silkworm eggs from the Sericultural Station at Phu-lang-thuong have been introduced into this district, silkworm rearing has been very successful, and the silk, though rough on account of primitive methods employed, is of good quality. The Administration is engaged in promoting silkworm rearing among the natives.

Agricultural Production of New Zealand in 1912.

New Zealand Department of Agriculture, Commerce and Tourists. Annual Report 1912, pp. 229-4 figs. Wellington, N. Z., 1912.

Agricultural production.

Area of the Dominion (including the Chatham and other islands) 66 791 680 acres.

Area in occupation (1910-1911).

	Acres
Crops	1 729 304
Fallow Land	209 973
Sown grasses; Land ploughed	5 000 226
" not ploughed	9 214 515
Native grasses, etc.	23 972 236
Orchards, Plantations, Gardens, etc.	111 672
Total area in occupation	40 238 126

Area under Cultivation (1910-1911).

	Acres
Corn and Pulse Crops	1 015 822
Green Crops.	713 682
Sown Grasses	14 214 741
Fallow Land, Orchards, Plantations, Gardens, etc.	321 645
Total area under cultivation	16 265 890

Number of Holdings (1 acre and over) (1910-1911) . . . 73 876

528 DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES

Area under different Crops.

Corn and Pulse Crops	1910-1911	1911-1912	Green Crops	1910-1911
	acres	acres		acres
Wheat	336 389	215 528	Potatoes	29 023
Oats	593 396	403 668	Turnips	450 959
Barley	38 131	31 644	Mangolds.	14 082
Maize	18 857	6 094	Rape	208 057
Peas and Beans	17 336	—	Carrots	2 363
Hops, Rye, Vetches, Linseed, etc.	11 713	—	Beet	279
			Other Green Crops . .	8 919
Total . . .	1 015 822	—	Total . . .	713 682

Live-Stock, 1911.

Horses	404 284
Cattle	2 020 171 (633 733 Dairy cows).
Sheep.	23 996 126 (1 819 339 Merinos; 22 176 787 Longwool)
Pigs	348 754
Angora Goats	6 119

Number of animals slaughtered in 1912.

	At ordinary slaughterhouses	Under inspection	
		Abattoirs, etc.	At Meat Slaughter
Cattle	67 680	85 687	69 61
Calves	1 285	10 262	3 12
Sheep	313 285	591 068	2 285 17
Lambs	38 150	103 410	3 050 34
Swine	56 392	154 206	21 49

Agricultural Exports in 1912.

	Quantity	Value £		Quantity	Value £
... lb.	182 883 067	6 579 074	Hemp. tons	18 094	310 884
... cwt.	327 282	1 776 440	Tow. »	2 823	23 289
... »	463 610	1 297 088	Timber . . . sup. fl.	95 710 967	468 181
... »	1 167 980	1 750 236	Kauri-gum. . . tons	6 952	368 228
... »	1 068 881	1 197 594	Fungus . . . cwt.	2 925	6 136
... »	500 022	250 304	Wheat . . . bu.	1 123 730	197 623
ed . . »	11 929	13 303	Oats »	314 254	37 502
... »	16 364	190 685	Barley. »	133 604	29 229
Meats cwt.	64 642	136 433	Beans, peas and maize »	275 949	66 731
and Hares »	91 546	78 041	Bran and pollard tons	1 235	5 901
... »	2 566	6 538	Seed, grass and clover . . . cwt.	18 396	40 011
... »	174 106	159 835	Flour tons	167	1 403
and Rabbit ... »	17 650 180	676 407	Hops cwt.	1 874	11 594
... tons	25 821	566 373	Potatoes. tons	1 307	6 439
skins (cas- ... cwt.	24 516	66 801	Chaff, hay and straw »	166	1 115
			Fish and oysters. .	—	33 989

old experiments in cooperation with farmers are decidedly popular. Department of Agriculture, in consultation with the farmer, sets out seed and supplies seed and fertilizers. The farmers provide the land and labour and receive in return the crops; the experiments are supervised by officers of the Department. In 1912 the number of farmers participating was 400, and the number of plots 5205. The experiments comprise a number of combinations of fertilizers and many plants, especially fodder plants and cereals, and they have shown among other things that silver-beet is an excellent forage plant and that lucerne is to be much more widely grown in New Zealand.

Experiments are in course for regrassing the vast areas which have been ruined by fire, overstocking, and by rabbits in Central Otago, in the Macrae region, in the pumice lands of the central part of North Island, and in the gum lands of North Auckland. The first have been enclosed by a wire netted fence to ensure control of rabbits, and a proportion of the land has been sown to various grasses; the most promising results were

obtained with cocksfoot, "chilian fescue" (*Festuca dumetorum*) and mon couch.

The Government has offered a bonus of £12 000 to reward anyone who may provide improved machinery for the preparation of the New Zealand hemp (*Phormium tenax*); this is at present effected by a machine which has hardly been modified for half a century.

Manawatu is the most important district in the production of hemp, and Tooton is the largest grading station. In 1912 it turned out 36 892 bales (against 33 176 in 1911) and 9 457 bales of tow (against 10 191 in 1911).

The average prices of New Zealand hemp during 1911-12 were: good-fair, £17. 5s per ton; fair, £16 5s per ton. Tow: first, £8 5s; second, £7 10s; third, £6 15s per ton. All the above prices f. o. b. Wellington.

The area under orchards is rapidly increasing: it was about 30 000 acres in 1912, against 34 000 in 1911 and 28 500 in 1908. Vineyards occupied 779 acres in 1911 and 663 in 1908-9. Of late years the grading and packing of fruit have improved very much; this is in a great measure due to the instruction in these subjects provided by the Department of Agriculture. Storage of fruit is growing in favour. Co-operative fruit-testing plots have been planted. There is a great demand for apples for export and it is anticipated that this branch of exportation will soon develop considerably. The government encourages the planting of apple orchards. In the year ending March 31, 1912, New Zealand exported £3 334 worth of apples and imported £441 387 worth.

In 1912 twenty new factories were built in New Zealand for the manufacture of cheese, seven for the making of butter and one for the production of casein, the first in the Dominion.

The practice of systematically testing cows' milk for butter-fat throughout the whole year has rapidly spread since the Department of Agriculture founded several cow-testing associations.

A number of cheese factories pasteurize the whey before returning it to the suppliers of milk, with the object of avoiding the spread of tuberculosis in calves and pigs.

In some cases New Zealand butter has been found to develop a "fishy" flavour. It has been demonstrated that fishiness is very apt to develop when the cream from which the butter was made contains too high a percentage of acidity, that is, more than 0.3 per cent. in cream containing 40 per cent. of butter fat.

In Great Britain, and in New Zealand and some other countries, enactments provide that butter shall not contain more than 16 per cent. of water; the Commonwealth of Australia has recently fixed the limit at 15 per cent.; 1985 samples of butter were tested for water at the various grading posts and the average water content was found to be 14.25 per cent.

The following table shows the number of bee-keepers and hives and the quantity of honey and wax produced during the year as ascertained at the census of 2nd. April, 1911.

Number of Persons keeping Bees	Number of Beehives	Honey produced during Year	Bee-wax produced during Year
11 002	71 584	1 457 272 lbs.	28 061 lbs.

king 5d. per pound for the honey and 1s. 3d. per lb. for the wax, the value of the output for the year would amount to £32 113 12s. 11d. The honey exported for the twelve months ended 31st. March 1912 was 1,457,272 lbs., valued at £2 255.

At the Wallaceville Laboratory, among other work, experiments have been carried on in the direction of ascertaining the effects of ergot on live-stock, with the result that sheep did not show any sign of ergotism while they were affected.

In other investigations were made on bush sickness. All the evidence pointed to the condition being one of malnutrition rather than of poisoning, and that probably a deficiency of available iron is the cause of the disease. The disease disappeared from the pumice land pastures where the grass was in the best condition when these were top dressed with soluble iron salts and with superphosphates.

Protection of agricultural produce. — One of the greatest pests of agriculture in New Zealand is the rabbit. In the settled districts and on the whole under the administration of the Rabbit Boards of Hawkes Bay and the East Coast the rabbit nuisance is under control. The business of rabbiting for export is firmly established in some districts and in others it is practised.

The two most injurious weeds in New Zealand are the blackberry and the Californian Thistle. It is hoped to control the first by means of an insect belonging to the genus *Tortrix*, and the second by parasitic wasps.

During the year numerous specimens of the following weeds were sent from various parts of the Islands: Mediterranean rocket (*Eruca sativa*), black mustard (*Brassica nigra*) and lantana (*Lantana camara*).

Systematic spraying for the control of insect and fungus pests is compulsory by law. Woolly aphis and apple and pear scab in orchards, wheat mildew, wheat mildew and grass rust in wheat, and Irish blight in potatoes have been reported.

The inspection of all fruits, plants, vegetables, etc., that are imported is compulsory.

Importation into Germany, in 1912, of Produce from the German Colonies.

Koloniale Rohstoffversorgung des Deutschen Reiches. — *Deutsche Kolonialzeitung*, No. 30, No. 6, p. 86, Berlin, February 8, 1913.

The following data are taken from the official statistics (*Amliche Statistik*, December 1912).

532 DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES

Colonial Products	Importation into Germany from all countries 1912	Importation from the German colonies		
		1912	1911	Colony
	lbs.	lbs.	lbs.	
Coffee	385 808 500	385 808	1 212 541	German E. Africa (S bara).
Cacao	121 254 100	(1) 2 733 729	3 262 838	Togo; Kamerun; G
Cotton	(2) 1 102 310 000	2 866 006	—	German E. Africa
Sisal hemp . . .	7 072 421	5 004 487	—	German East Africa
		257 058	—	Togo.
Rubber	(3) 45 415 172	4 505 141	—	Camerun.
		1 887 816	—	German East Africa
Cedar Wood . . .	(4) 12 191 549	837 756	—	" " "
Mangrove-bark . .		3 152 607	—	" " "
		15 893 106	—	German Australasia moa excluded.
Copra	404 014 252	4 830 322	—	Samoa.
Coconut kernels .	576 298 691	34 467 029	—	German Africa.
Palm oil	31 268 125	568 792	—	" "
Earthnuts	154 323 400	440 924	—	" "

- (1) Worth about £ 188 000.
(2) " " " 24 600 000.
(3) " " " 8 568 000.
(4) 11 355 793 lbs. imported from America.

336 - Export of Danish Agricultural Products in 1912.

The Danish Export Review, Vol. XVIII, No. 1, pp. 3-4. Copenhagen, January

The following figures are supplied, by the State's Statistical

Butter, Cream and Milk.

	1912 Million lbs.	1911 Million lbs.	Average price for 1912
Butter . . .	over 187*	197	1s. 1d. per lb. ¹
Cream . . .	little under 60	44	
Milk	over 18.7	23	

* Of which about 6.6 mill. lb. packed in tins.

** About 3 % higher than in 1911.

the ordinary form of packing barrels the following quantities were exported in 1912:

about 169 $\frac{1}{2}$ million lbs. to Great Britain.
somewhat over 5 $\frac{1}{2}$ million lbs. to Germany.
" " 6.6 " " " Austria.

1911, 1910, 1909 and 1908 the butter export to Great Britain respectively 178.9 181.5, 184.1 and 187.2 million lbs. For the period of time England's total consumption of butter from abroad her colonies taken as a whole has been diminishing or keeping steady. The export of cream and milk is confined to Germany; most of butter in tins takes place chiefly to transatlantic and distant countries. About 19 per cent of the total export from England, which represents a butter quantity, of about 200 million lbs. to countries other than Great Britain; some years ago the same percentage for other countries only amounted to about 10 per cent.

Pork and Bacon.

	1912 Million lbs.	1911 Million lbs.	1910 Million lbs.	1909 Million lbs.	1908 Million lbs.	1907 Million lbs.
Pork	14.3	—	—	—	—	—
Bacon	262.9	—	—	—	—	—
Pork in barrels	4.4	—	—	—	—	—
Total	281.6	251.9	213.4	209	239.8	212.3

Offals:

Export in 1912.

	Million lbs.
Heads and feet of pigs	16.5
Hearts, liver and plucks	9.9
Guts	12.1
Stomachs	3.3

The principal quantity of the exported meat from pigs is prepared in the form of "cured" i. e. lightly salted pork in bales. Towards the close of the last century there began a comparatively important rise in the export of pork, which in 1912, 1911 and 1910 was respectively 14.3, 3.3 million lbs. The bacon export goes entirely to England, but 2 millions lbs. of fresh pork went to that country, the chief part going to Switzerland, Germany and Holland. Whilst in 1911 15 million lbs. of bacon went to countries other than Great Britain, in 1912 about 16 million lbs. were exported to other countries. The export of offals is also rising as regards the total export value.

Cattle and Beef.

	<i>Exports.</i>				
	1912	1911	1910	1909	1908
Live cattle	125 000	153 500	140 800	124 000	121 600 heads
Beef and veal	57.7	28	36.3	34.1	24.2 million

The large import in 1911 of about 29 000 head of Swedish which was principally slaughtered for export, was diminished in 1912 by 8000 head, so that the export surplus has risen considerably than the actual export. All the live cattle, with the exception of 800 to 900 head which were sent to Russia, went to Germany. This was exported to:

	1912 million lbs.	1911 million lbs.
Germany	49.5	20.9
Switzerland	3.3	4.4
Norway	3.3	1.1
Great Britain	1.7	1.1

Horses.

	<i>Exports.</i>				
	1912	1911	1910	1909	1908
	24 900*	28 500	26 100	22 700	18 600

* About 22 500 horses and 2400 foals.

The import of foreign horses for the last three years was the same, namely 14 to 15 thousand.

Eggs.

	<i>Exports (in million score).</i>				
	1912	1911	1910	1909	1908
	over 19	21.5	20.5	over 19	over 21

The decline in the egg export in 1912 is due to the cold and spring months of 1912. About 5 per cent of the export is sent to countries other than Great Britain.

The agricultural products mentioned in this article represent between 4/5 and 5/6 of the entire export. In 1911 its value represented over £23 967 000, whilst other agricultural goods and goods of agricultural origin were exported for about £5 500 000. The total value for 1912 for the above-mentioned articles shows a rise of £1 600 000; for each of the two preceding years the rise was about the same. Higher average prices for the year have been paid for the products derived from Danish domestic animals.

Exportation of Agricultural Produce from the State of Rio Grande Sul, Brazil.

SEN, G. Alguns aspectos do Rio Grande rural em 1912. — *Estado do Rio Grande do Sul. Boletim Técnico da Secretaria da Estado dos Negócios das Obras Públicas*, 1912, 5, pp. 193-211. Porto Alegre.

These are: comparative statistics for 1910 and 1881 of the exportation of the principal agricultural products, a summary description of various regions of the State, of the condition of the principal crops, of stock breeding, and of animal industries.

Exports in 1910 (*).

Vegetable products	animal products
£	£
Maté 200 500	Dried meat . . . 1 745 692
	Hides 1 021 150
Manioc flour . 196 651	Tallow 340 800
Tobacco . . . 172 125	Lard 229 200
Beans 586 350	Milk 183 641
	Canned meat . . 122 675

The milreis is valued at 18 d (The average value of the milreis in 1909 was 17 3/4 d *Osman's Year-book for 1912*, p. 680). Maté to the value of £ 915 110, tobacco, 1 609 785 and skins and hides for £ 2 418 107 were exported from Brazil in 1910. (Ed.).

The Organisation and Present Condition of Agricultural Instruction in Belgium.

DER VAEREN, JULIEN. L'organisation et la situation actuelle de l'enseignement agricole en Belgique. — *Revue des Questions scientifiques*, Series III, Vol. 23, pp. 237-271. Paris, January 20, 1913.

After a short review of the historical development of Agricultural Instruction in Belgium, the writer describes its present organization. He first of all draws a distinction between two large divisions of agricultural schools; those for youths and boys and those for girls. In both, the modes of instruction are different: there are colleges for young men, similar institutions for girls, agricultural secondary schools of higher and lower grade and also higher and lower elementary schools.

Belgium possesses two agricultural colleges, the Agricultural State College of Gembloux and the Agricultural Institute of the University of Liège. In order to be admitted at either as a regular student, the student is necessary to have completed the intermediate course of studies and, in addition, to have passed an examination in mathematics. The course is three years at both Institutes; after this comes a fourth year, during which the student can pursue his studies further in one of the following branches: 1) Agriculture and Instruction; 2) Agricultural Chemistry and Industry; 3) Forestry. On passing the examination at the close of the three years' course, the student receives the title of "ingénieur agricole". The Gembloux Institute, which opened

in 1861 with 37 students, had 175 in the session 1911-12; while Louvain Institute had 200 students in 1910-11, as against 151 when it was opened.

As agricultural intermediate schools of higher grade, the writer mentions the free Agricultural Schools of Carlsbourg, La Louvière, Leuze, and the State School of Practical Agriculture at Huy. In these are educated agents for medium-sized farms, smaller agricultural tries, etc. The course in the two first lasts for three years, but two years in the Huy Institute. The students must have been in a higher grade elementary school or an intermediate lower school. The teaching staff is chiefly composed of "ingénieurs agricoles". In 1910-11, the number of students was as follows: Carlsbourg 52; La Louvière 29; Leuze 97; Huy 29, in all therefore 207.

The 26 agricultural divisions, which are attached to free or intermediate schools, etc., are agricultural intermediate schools of higher grade, as is understood by the writer. Their curriculum includes agricultural subjects; these are mostly taught by "ingénieurs agricoles". The course in these schools is also a three years' one. The students are liberally supplied with apparatus and materials, 30 to 50 per cent cost of these being defrayed by the State. The number of students in these schools rose from 275 in 1900 to 822 in 1911. The writer places special stress upon the fact that in these schools, as in the free agricultural institutes, no instruction is given in practical agriculture; the students, being mostly peasants' sons, acquire practical experience on their fathers' farms.

The writer considers the following as elementary agricultural schools of higher grade:

1. "Sections professionnelles agricoles primaires" (Professional Agricultural Schools).
2. "Sections professionnelles ambulantes" (Agricultural travelling schools).
3. Schools, sections and courses of instruction in agricultural machinery.
4. The Agricultural course of instruction in State institutions and free institutions.

Today there are 28 "sections professionnelles agricoles primaires", which might well be entitled "agricultural winter schools": these are opened every week for 2 or 3 afternoons during 3 or 4 winter months, when the schools are independent, 2 to 3 ½ hours on 3 to 5 evenings, if the school is attached to an elementary school.

The curricula of these schools must, as far as possible, be adapted to the requirements of the district. The teachers are, in many cases, "ingénieurs agricoles", but they are usually elementary teachers who possess a certificate for agricultural instruction. In 1911-12 the number of students was 1062.

Travelling agricultural schools were first started in 1904; there are now ten of these in Belgium. Instruction is also given in these schools only during the winter months and generally by specialists, such as "ingénieurs agricoles", veterinaries, experts in agricultural machinery,

o they have been attended by 25 to 40 farmers of from 17 to 35 f age.

gium has three schools of agricultural machinery, at Mons, Leuze mur. The course is held in the winter months and lasts one winter s and Namur and two at Leuze. The instruction is both practical oretical. Most of the teachers are "ingénieurs agricoles".

the winter 1911-12, 50 students attended at Mons, 81 at Leuze, at Namur, this being the first year of the existence of the school. the Fleurus and Avelghem agricultural machinery departments, re attached to other Institutes, 22 and 30 students respectively i instruction during the same winter.

the provinces of Brabant and Liège there have been 4 travelling of agricultural machinery for a year; and during this first year re attended by 22 or 23 students on an average.

the provinces of Limburg, Namur and Luxembourg several courses i 10 to 15 lectures with demonstrations were held on agricultural ery; these were attended by 20 to 50 students each.

50 State schools and in the same number of free intermediate , one or two hours have been devoted weekly to agricultural ; these were attended by 2862 scholars during the school year.

e writer considers that the numerous lectures on different branches ulture constitute arrangements for lower grade elementary agricul- struction. These are held in villages especially during the winter, be agriculturists, "ingénieurs agricoles", agricultural teachers, etc. e 116 agricultural libraries, and the free information supplied to mers by the experiment stations and State agriculturists are also ned.

ce 1911, special agricultural instruction for training country house- ; teachers has been given in the fifth optional year at the Teachers' s of Wavre-Notre-Dame and Héverlé. Belgium possesses 14 coun- se-keeping schools with a two-years' course; these were attended school year of 1911 by a total of 436 pupils. The 5 departments ntry housekeeping, which were attached to other Institutes, had lis during the same year. Further, there are 13 travelling house- ; schools, which give a 3 to 4 months' practico-theoretical course in it districts. So far, departments of instruction in country house- g are only attached to 10 elementary schools.

addition, during the last 10 years numerous lectures have been to the female agricultural population on agricultural subjects espe- interesting to women.

the teachers' colleges, which are under the administration of the ry of Arts and Sciences, the study of agriculture is obligatory in rd year, as the curriculum of the elementary schools includes one hours' weekly instruction in this subject. Vacation courses are nually from August to September in the Teachers' Seminaries of s and Ghent; the teacher who attends these and passes an exami-

nation in the Easter holidays, obtains a certificate "of competent imparting instruction in agriculture".

In conclusion, the writer mentions that the authorities of the province of Hainaut opened a school in 1911 at Ath for agriculture stock-breeding; the course is a three-years' one. The province of Brabant in 1911-12 opened two more winter schools at Court-St-Etienne Tirlemont; these were each attended the first year by from 25 students.

339 - The New Bill for the Advancement of Agricultural Instruction in Canada.

Communicated by T. K. DOHERTY, Commissioner of the International Institute of Agriculture in Canada.

A Bill of the greatest importance to agriculture in Canada was introduced in the House of Commons on January 24th, 1913, by the Hon. Mr. Burrell, Minister of Agriculture. The new measure is the practical application of the "Agricultural Aid Act" passed in April, 1912, which gave power to the Governor-in-Council to make grants to the Provinces for the encouragement of Agriculture.

On the passing of the Act in Aid of Agriculture, Dr. C. C. James, Deputy Minister of the Ontario Department of Agriculture, was appointed to investigate agricultural conditions in Canada and ascertain in what way the federal authorities could best assist the provinces in developing their basic industry. Dr. James has consulted with the provincial governments and with the men in charge of the various agricultural institutions of the country and the results of his work is the new Bill now before the House of Commons.

The new law is "for the purpose of aiding and advancing the basic industry by instruction in agriculture." The money voted to the provinces under it will be devoted exclusively to agricultural education. The object of the Act is to increase the efficiency and equipment of the agricultural colleges, establish agricultural schools, dairying and horticultural schools, and short courses in agriculture, and to initiate agricultural instruction in the public schools and work by travelling or located qualified instructors. Educational work will also be carried on by means of demonstrations and the training of teachers in domestic science and nature.

According to the terms of the new Bill \$10 000 000 are to be given to the provinces to be expended on agricultural education during the next ten years. 700 000 will be allotted the first year and this amount increased by \$100 000 annually until 1917, from which year until 1921 \$1 100 000 will be provided yearly.

Speaking broadly the division of the money among the provinces will be on a population basis. There are, however, slight modifications to this principle. In the first place, \$20 000 a year is to be set aside to be provided among such veterinary colleges as grant degrees and come to a required standard. In addition \$20 000 will be allotted to each pro-

less of population. With the exceptions mentioned, the provinces are as follows :

	1913.	Yearly Increase.	1917-23.
Prince Edward Island	\$ 26 529.85	\$ 1 306	\$ 31 753.73
Nova Brunswick	44 509.93	4 902	64 117.87
Alberta	46 094.95	5 219	66 970.91
British Columbia	47 334.76	5 467	69 202.57
Saskatchewan	51 730.05	6 346	77 114.09
Manitoba	54 288.45	6 858	81 719.21
Ontario	54 296.29	6 859	81 733.32
Quebec	159 482.40	27 896	271 068.32
Atlantic Provinces	195 733.32	35 147	336 319.98

It is provided that if in any year any province is not prepared to use grant, the unused remainder shall be held by the Dominion for future use of that province, or until such time as it can make good a claim, or good cause for its payment. If from lack of educational machinery, any other reason, any province is not able to submit a satisfactory report, the Federal Government would be prepared to formulate one for the province's assent.

The Land Cultivation Commission and the Land Cultivation Office Schleswig-Holstein.

Landeskulturrkommission und Landeskulturstelle in Schleswig-Holstein. — *Zentralblatt der Preussischen Landwirtschaftskammern*, Year 12, No. 8, pp. 57-58. Berlin, February 24, 1913.

The province of Schleswig-Holstein has formed an organization for reclaiming of waste lands and moorland; it is under the president of the Government district and in close connection with the Chamber of Agriculture.

The work of the *Land Cultivation Commission* consists in collecting and making known the results obtained in the cultivation of waste lands and in promoting efforts in this direction by means of advice and information; the *Land Cultivation Office* is occupied with the especially important side of the question.

In the province of Schleswig-Holstein there still remain about 100 000 acres of waste land to be reclaimed, of which 82 000 acres are moors and 21 500 acres consist of mineral soil. About 9 300 acres of the areas are State property. Nearly 70 400 acres are about to be reclaimed, including only 378 acres of high-moor. Hitherto over 100 000 acres of fen and of mineral soil have been improved at an outlay of £1 323 000. The province will provide £2 940 in the new year; the Ministry of Agriculture for the further promotion of the reclamation of the large areas of waste lands which still exist.

341 - Agricultural Exhibitions and Competitions in 1913.

Argentine Republic.

Sept. 1-18. Palermo, Argentina. — The "Sociedad Rural Argentina" will hold its yearly live stock show at Palermo in September 1 to 18, 1913. Besides live stock, the show include forage of all sorts, fruit, vegetables, etc., products in the country, as well as agricultural machinery and industrial plant, both national and foreign. Applications for mission are to be addressed to the Sociedad Rural Argentina, Buenos Aires, Florida, 316.

Nov. 9-12. Palermo. — The same association organises also: a fat stock show; B. a milch-cow show. The first includes two divisions. 1. For breeders: a) cattle: Durham and crosses; Hereford and crosses; Aberdeen-Angus and crosses; other breeds; cross-breeds; b) sheep: Lincoln and similar breeds; blackfaced and other breeds; pigs; d) poultry. The prizes offered are the following:

Prizes for each class.

	Championship	1st Prize	2nd Prize	3rd Prize	4th Prize
	£ s	£ s	£ s	£ s	£ s
Cattle (individual)	43-17	43-13	35- 2	26- 6	18- 0
Sheep (groups of 5)	21-18	21-18	17-11	13- 2	8- 0
Pigs	21-18	10-10	8-15	4-13	2- 0
Poultry	—	4- 7	3-10	2-12	1- 0

Two championship prizes will be awarded to cattle: one the best live animal, the other to the animal that has yielded most at the butcher's test.

2. The second division of the fat stock show is reserved for small farmers, and it is proposed thus to encourage the fattening of one or a few head of cows, pigs or sheep. There will be a championship prize of £87 14s. for the best head of cattle of all breeds, and prizes for the various classes of sheep equal to those of the first group.

B. The show of milch-cows will include pure breeds and crosses. The cows must not be more than 7 years old and must have stood the tuberculin test.

Austria.

May-October. Vienna. — Exhibition of the Austrian Adriatic Region. This exhibition is intended to acquaint the public with the products of the Adriatic region.

with the history, the art and the production of the region. It will include, among other items, sections for agriculture, forestry and industries. For information apply to: "Arbeits Komitee, Oesterreichische Adria Ausstellung," Rotunde, Vienna.

May 11-16. Prague. — Exhibition organized by the Central Agricultural Association for the Kingdom of Bohemia. Address "Exhibition Committee, Central Agricultural Association for the Kingdom of Bohemia," Prague.

May 24-June 1. Vienna, at the Prater. — 32nd National Horse Show. Address: "Ausstellungsbureau", Schaufelergasse 6, Vienna 1.

September. Vienna. — The Imperial and Royal Agricultural Association (K. K. Landwirtschaftsgesellschaft) of Vienna is organizing an exhibition of breeding and of production stock which will include sections for agricultural machinery and implements.

1911.

August 24-31. Antwerp. — Agricultural Show.

September 21 to 23. Manage, Hotel de Ville. — General Horticultural Exhibition. — Market gardening, Fruit-growing, Floriculture and connected Industries.

1912.

July 8-13. Winnipeg. — Competition of Agricultural Motors connected with the Annual Exhibition of the "Canadian Industrial Exhibition Association."

August-September. Toronto. — Annual Canadian Exhibition. Address: Exhibition Department, City Hall, Toronto, Canada.

1913.

April 11-18. Caen. — Annual Exhibition of the Poultry Association of Lower Normandy. Address: M. Langevin, Secretary, 72 Rue de Bayeux, Caen.

May. Lyons. — International Urban Show. Horticulture forms the 40th section and is divided into three classes: 1. Gardens; 2. Flowers; 3. Floral Decorations of Towns and Gardens. Address: Dr. Jules Courmont, Hotel de Ville, Lyon.

May 1-4. Saint Nazaire. — National Poultry Show organized by the Saint Nazaire Poultry Association. Address to the seat of the Association: Place Saint-Marceau, Saint Nazaire (Loire-Inférieure).

May 1-4. Bourges. — Poultry Exhibition of the Poultry Breeders' Association of the Cher. For information: M. Guerrier, banker, Bourges (Cher).

May 21-26. Paris. — General Exhibition.

May 25-June 1. Nancy. — State competition of the East of France organized by the French Horse Society.

- May 31-June 5. Périgueux. — General Horticultural Show organized in connection with the seventeenth congress of the Friends of Roses, French Society of Rose-growers (June 1-3), by the Horticultural and Agricultural Society of the Dordogne. Address: Count de Lestrade, President of the Society, at Périgueux.
- June 8-30. Bar-le-Duc (Meuse) — Exhibition organized by the Horticultural Society of Bar-le-Duc.
- June 26-July 6. Vichy. — Competition of the South-East France organized by the French Horse Society.
- July 18-27. Boulogne-sur-Mer. — Competition of the North France organized by the French Horse Society.
- September. Jonville, Haute-Marne. — General Horticultural Exhibition organized by the Horticultural Society of the Haute-Marne.
- October. Puiseux Farm, Seine-et-Oise. — Competition of Mechanical Tillage. Experiments organized by the Society of Agriculturists of France under the patronage of the French Committee of Mechanical Tillage. Cultural and mechanical observations will be made. A sum of about £800 will be devoted to these experiments. There will be no classification nor awards; nevertheless some indemnities will be granted to makers and representatives who take part in the experiments.
- November 8-15. Epinal. — Chrysanthemum and autumn produce Show, organized by the Horticultural and Vine-growing Society of the Vosges. Address: the President, 1 Rue Thiers, Epinal.
- November 19-23. Moulins. — Poultry Exhibition organized by the Poultry-breeders' and Agriculturists' Society of the Bourbonnais and of the Centre. Particulars: M. Buvat, President, 8 Avenue Victor Hugo, Moulins (Allier).
- German South-West Africa.*
- May 24. — Agricultural Exhibition at Windhoek, German South-West Africa. The Exhibition will include: South African breeds of stock; dairy products; plant products; agricultural machines and implements. For particulars apply to the Geschäftsführenden Ausschuss für die Landwirtschaftliche Ausstellung, 1913, Windhoek, German South-West Africa.
- Germany.*
- April 14-16. Munich. — Thirty-first market of Carriage, Saddle Breeding and Draught Horses.
- April 24. Berlin. — Exhibition of Fat Stock and Horse Show.
- May 29-June 2. Königsberg. — Agricultural Show (Landwirtschaftliche Provinzial- und Jubiläumsausstellung). For particulars apply to Landwirtschaftskammer, Königsberg.

June 5-10. Strasburg. — Thirty-sixth Exhibition of the German Agricultural Society (Deutsche Landwirtschafts Gesellschaft).

June 7-15. Breslau. — Fruit and Vegetables Show.

June 11-13. Cologne-Merheim. — Provincial Horse Show organized by the Chamber of Agriculture of the Province.

October 4-20. Dortmund, Westphalia. — Second Provincial Horticultural and Gardening Show. For applications for entries and for other particulars address "Geschäftsstelle des Obstbau-Verbandes" in Herford, Unter den Linden 7.

ind.

July. Boskoop. — Horticultural Show.

April 12-22. Casal Monferrato, Piedmont. — National Exhibition of typical Italian wines, organized by the Society of Italian Vine Growers.

May 10-19. Rome. — Villa Umberto I, National Flower, Plant and Fruit Show. For particulars address: Associazione nazionale italiana per il movimento dei forestieri, Sezione di Roma.

gal.

Lisbon. — International Poultry Show. For particulars apply to M. Manuel de Almeida e Castelo-Bramo, rua da Sociedade Pharmaceutica, 37, Lisbon, Portugal.

ian Empire.

August to September. Khabarovsk, Amur Province, Siberia. — An Agricultural and Industrial Exhibition is to be opened at Khabarovsk in July or August 1913 for a period of two months. It is intended to present as complete a picture as possible of the actual condition of the Amur region and will include: Articles relating to the study of the geography, natural history, and economy of the region; produce of the farming, forest, mining, fishing, hunting, manufacturing and cottage and artisan industries; articles imported into and exported from the region, etc.

August to September. Juriëff, Livonia. — Two agricultural shows will be held at Juriëff in 1913. The first will be opened in August. For information, apply (in German) to the "Präsident des Nordlivländischen Ausstellungskomitees," Juriëff, Livland, Russia. The second, devoted especially to the peasantry, will be open from August 29 to September 1 and is organized by the Estnische Oekonomische Genossenschaft at Dorpat, Livland, Russia.

† Africa.

May 22-24. Agricultural Show at Pretoria.

May 30-31. Agricultural Show at Rustenburg, Transvaal.

June 4-5. Agricultural Show at Wolmaranstadt, Transvaal.

June 25-27. Agricultural Show at Pietermaritzburg, Natal.
 July 2-4. Agricultural Show at Durban.

Spain.

May 21-26. The National Society of Breeders (Asociación general de Ganaderos) organizes a Stock Show and an Exhibition of National Dairy Produce; an Exhibition, open to foreigners also, of Agricultural Machines and Implements. Particulars apply to Secretaria de l'Asociación de Ganaderos, 30, Calle de las Huertas, Madrid.

Sweden.

May 15-September 31. Malmö. — Exhibition of the Baltic Countries. General and industrial exhibition with a section of agricultural machines. The exhibition is mainly devoted to the countries bordering the Baltic: Sweden, Russia, Germany and Denmark. For particulars apply to Styrelsen för Baltiska Utställningen, Malmö, Sweden.

United Kingdom (1).

April 14, 15. Dublin, Ball's Bridge. Spring Show of the Dublin Royal Society.

May 14, 15. — Newark Agricultural Show, Newark. C. T. Baines, Secretary, 52, Lombard-Street, Newark.

May 14-16. — Somerset County Agricultural Association, Taunton. W. R. J. Greenslade, Secretary, 3, Hammet-street, Taunton.

May 21-23. — Devon County Agricultural Association, Barnstaple. E. R. Callender, Secretary, The Warren, Starcross, Devon.

May 28, 29. — Leicestershire Agricultural Society, Victoria Park, Leicester. P. L. Kirby, Secretary, 25, Horsefairs-lane, Leicester.

May 28-30. — Royal Ulster Agricultural Association, Balmoral, Belfast. Kenneth MacRae, Secretary, Balmoral, Belfast.

June 3-5. — Herefordshire and Worcestershire Agricultural Society, Hereford. T. H. Edwards, Secretary, Corn Exchange Office, Leominster.

June 4, 5. — Northamptonshire Agricultural Society, Town Hall, Northampton. Entries close May 10. J. E. Lovell, Secretary, Northampton.

June 10-13. — Royal Counties Agricultural Society, Windsor. Simmons, Secretary, Basingstoke.

June 24, 25. — North-West of Ireland Agricultural Society, Londonderry. Entries close June 4. Oliver P. O'Neill, Secretary, Castle-Street, Londonderry.

June 25, 26. — Doncaster Agricultural Society, Doncaster. Entries close June 7. F. H. Chafer, Secretary, 9, Market-place, Doncaster.

(1) See also No. 102, *B. Feb.* 1913.

- ly 1-5. — Royal Agricultural Society of England, Bristol. The prizes amount to over £10 000. Special efforts are being made for the success of the "Overseas exhibit." Application for further particulars should be made to Thomas McRow, Secretary, Royal Agricultural Society of England, 16 Bedford Square, London, W. C.
- ly 8-10. — Peterborough Agricultural Society, Peterborough. Entries close June 2. J. E. Little, Secretary, Queen-street, Peterborough.
- ly 16-18. — Lincolnshire Agricultural Society, Lincoln. Entries close June 7. W. Frankish, Secretary, St. Benedict's Square, Lincoln.
- ly 23-25. — Yorkshire Agricultural Society, York. Entries close June 7. John Maughan, Secretary, Blake-street, York.
- ly 31, Aug. 1, 2, 4. — Royal Lancashire Agricultural Society, Burnley. Entries close June 9. E. Bohane, Secretary, Derby House, Preston.
- ugust 26-29. — Royal Dublin Society, Ball's Bridge, Dublin.
- ct. 21-24. — British Dairy Farmers' Association (Dairy Show), Royal Agricultural Hall, London, N. Entries close September 12. F. E. Hardcastle, Secretary, 12, Hannover-square, London, W.
- ov. 1, 3-7. — Brewers' Exhibition, Royal Agricultural Hall, London. Entries close October 14. Jno. G. Hardy, Secretary, 46, Cannon-street, E. C.
- ov. 20-22. — Norfolk and Norwich Christmas Show Association, Norwich. Entries close October 25. Caleb Barker & Co., Secretaries, East Harling, Norfolk.
- ov. 29, Dec. 1-4. — Birmingham Cattle Show, Bingley Hall, Birmingham. Entries close October 20. W. H. Lythall, Secretary, Bingley Hall, Birmingham.
- ec. 8-12. — Smithfield Club, Royal Agricultural Hall, London, N. Entries close October 1. E. J. Powell, Secretary, 12, Hannover-square, London, W.
- ec. 15, 16. — Suffolk Fat Cattle Club, Ipswich. Entries close November 12. Robert Bond, Secretary, 6, Butter Market, Ipswich.
- d States.
- eptember 17 to October 1. Chicago. — Third International Exhibition of Cold Storage Plant. For particulars apply to 819 Exchange Avenue, Chicago, Illinois.
- International Competition for a Beet Lifter and Topper organized by the Great Western Sugar Company, Denver, Colorado, United States. The competition is open until March 1915, but the Company may at any time before such date close the competition and award the prize if a practical machine is presented and if the trials have given satisfaction.

The Association of the German Sugar Industry (Verein der Deutschen Zuckerindustrie) had offered for 1911 and 1912 a prize of 10 000 Marks (about £500) for a lifting and topping machine answering the requirements of the Association, but only a partial prize of 5000 Marks (about £250) has been awarded. A new competition will be held a few years after the prizes of the Great Western Sugar Company have been awarded.

342 - Agricultural Congresses.

National Dairy and Cold Storage Congress at Ghent.— This will be held during the 1913 International Exhibition. Corresponding Secretary of the Congress: O. André, 59, Rue des Arquebusiers, Bruxelles.

Third International Cold Storage Congress, New York, Washington, Chicago. September 14 to 24, 1913.— Information can be obtained from the Secrétariat de l'Association Internationale du Froid, 9 Avenue Carnot, Paris; the Secretariat of the American Cold Storage Association, 431 South Dearborn Street, Chicago, and from the Secretaries of one of the Associations, or National Committees, affiliated to the Association Internationale du Froid.

Fifth International Congress of Rice-Growing at Valencia, Spain, 1914.

CROPS AND CULTIVATION.

343 - Occurrence and Nature of Carbonized Material in Soils.

SCHREINER, O. and BROWN, B. E. — *United States Department of Agriculture, Bureau of Soils, Bulletin No. 90, pp. 1-28. Washington, December 1912.*

An examination was made of that portion of the organic material in soils which is soluble neither in water, nor in alkali, nor in any other ordinary solvent, and which remains visible to the naked eye as small black particles subsequent to treatment with solvents. Such particles were isolated from the soil mass by a system of hydraulic screening and of sedimentation in liquids of different specific gravities and finally by a separation under the microscope. On careful examination they could be classed under six headings:

- 1) Plant material of organic structure.
- 2) Insect and other material of organic structure.
- 3) Charcoal particles.
- 4) Lignite particles.
- 5) Coal particles.
- 6) Other material, some of which suggested intermediate stages

of formation.

These types of insoluble organic matter were found to exist also in the finer soil fractions, and black particles as a whole were invariably

not only in a large variety of surface soils examined, but also in soils down to a depth of 15 and 50 feet. The question of the origin of these dark carbonaceous particles is doubtful. The occurrence of transition stages suggests their formation from animal and vegetable remains by a process of slow decay, and of infiltration and deposition of organic matter in water. Other agencies which would contribute such material are suggested: *viz.* forest fires, the erosion of coal seams by ice with subsequent deposition, and the disintegration in rocks containing veins or seams of such material.

3. Influence of a Preceding Crop on Nitrification in Soil.

ROSE, L. T. and BIZZELL, J. A. Department of Soil Technology, Cornell University, Ithaca, N. Y. - *The Journal of Industrial and Engineering Chemistry*, Vol. 5, pp. 136-138. Easton, Pa., Feb. 1913.

A study of the principles of crop rotation will necessitate the investigation of the effect of plant growth on the soil. The writers have (*Journal of the Franklin Institute*, Jan. and Feb., 1911, pp. 1-20) that certain higher plants have a distinct influence on the nitrification in the soil; that this influence varies in intensity with different families, and at different stages of growth. It is that in a soil on which maize was growing the nitrates were higher at certain periods than in a similar soil on which no grew. *Phleum pratense* maintained uniformly a very low nitrate in the soil throughout the growing period.

A question then arose whether the higher plants exerted any influence on the activity of the nitrifying bacteria after the plants had been removed.

To test this, plots that were used for studying the effect of the nitrate contents of soils in 1910 were kept bare in 1911 and 1912. To keep down the weeds the plots were disc harrowed. Soil samples were taken from the sections of the plots that were planted in 1910, and the borings were made to a depth of 8 in. from the surface and again from 8 to 16 in.

Results in Planted and Unplanted Sections of Plots, Average for the Growing Season, 1910.

No.	Crop	Nitrates	On basis of	Nitrogen in
		per million of dry soil	nitrates in bare soil = 100	crop. lbs. p. acre
22, 23.	maize	167	123	3.5
	none	136	100	
24, 25.	potatoes	104	96	42.7
	none	108	100	
26, 27.	oats	90	71	28.7
	none	126	100	

The small maize crop is partially responsible for the high content of the maize soil, but this high nitrate content has also been in maize soil in previous years when the crop was good. Again, it is higher in the potatoes soil than in the oats soil, although the crop removed 50 per cent. more nitrogen. The nitrate content of the planted soil is not determined by the total quantity of nitrogen removed by the crop, but by a number of factors, of which one appears to be a direct influence which each species of plant exerts on the activity of the nitrifying organisms.

Nitrates in Soil Planted the Previous Year and Soil Unplanted, in vegetation until July 1st, 1911.

Plot Nos.	Crop	May 1		June 5		First 8 in.
		First 8 in.	Second 8 in.	First 8 in.	Second 8 in.	
		—	—	—	—	—
3612, 13, 22, 23.	maize	51.5	53.4	77.9	44.6	40.3
	none	48.1	52.3	68.0	44.0	40.3
3614, 15, 24, 25.	potatoes	31.3	26.0	49.8	26.4	28.6
	none	42.7	43.0	79.7	42.6	35.2
3616, 17, 26, 27.	oats	22.7	20.7	41.1	33.0	22.1
	none	32.3	39.6	68.4	34.8	33.6

The nitrates on the bare soil are in the same order as on the plots; except in the case of maize, they are lower on the plots than in the bare plots. The nitrates are highest in the soil planted to maize, next in that planted to potatoes, and lowest in that planted to oats.

Ratio of Nitrates in Bare Soil to Nitrates in Soil of Same Plots Planted.

Plot Nos.	Crop	Surface 8 in.			Second 8 in.	
		May 1	June 5	June 28	May 1	June
		—	—	—	—	—
3612, 13, 22, 23.	maize	108	114	100	102	101
3614, 15, 24, 25.	potatoes	73	63	81	60	62
3616, 17, 26, 27.	oats	70	60	66	53	55

To obtain this statement of the nitrates in the planted soil the plots in terms of the nitrates in the unplanted sections taken the nitrates in both planted ends of the four plots planted to the crop are averaged; the result is divided by the average for the unplanted sections of the corresponding plots. This is the most accurate means of comparison, as it removes more effect than any other method the local variations in the nitrate content of the soil. There is a distinct and characteristic difference in the nitrate content of the soil previously bearing the different plants. While

overs only one season the differences would seem to be too large defined to be accidental.

ly 1st the plots were drilled to millet, the entire plot being plant-growth of millet was in each plot markedly better on the second plot that had been in crop the previous year than on the un-ction.

Millet on the Plots Planted to Different Crops the Previous Year, as of the growth on the oats plots taken as 100, Sept. 8, 1911.

Soil treatment	Plot No.	Growth	Plot No.	Growth	Average growth
no lime	3 612	37	3 622	62	49
lime	3 613	47	3 623	71	59
no lime	3 614	60	3 624	81	70
lime	3 615	65	3 625	88	76
no lime	3 616	100	3 626	100	100
lime	3 617	100	3 627	100	100

of Nitrates in Soil Planted to Certain Crops and the Growth of the Millet on the Same Plots, June 28, 1911.

Crop in 1910	Relative nitrate content	Relative growth of millet
oats	59	100
potatoes	67	73
barley	100	54

in Unplanted Sections of Plots Limed and Not Limed.

Soil treatment	Nitrates in soil per million			
	May 4	June 5	June 28	Average
no lime	40.5	61.2	41.8	47.8
lime	54.8	74.9	38.7	56.1
no lime	59.9	76.9	34.3	50.3
lime	45.4	82.5	36.0	55.0
no lime	28.5	51.7	36.2	38.8
lime	36.2	85.2	40.3	53.9

evident that although the previous crop influences greatly the content of the soil, the growth of millet is not increased thereby. are not the limiting factor in the growth of millet on the experi-ol. Lime increases the growth of millet and also the formation s, but apparently its beneficial action must be due to some cause in its influence on nitrate formation.

cluding, the relation of the nitrate formation to the growth of this soil is a separate problem, probably peculiar to this parti-
But the interesting condition exists that, of the crops used

in the experiments, each had a certain and distinct influence on formation following the removal of the crops, and on the growth also following their removal; but the effectiveness on the influence is directly opposite. It is not to be expected, however, that this opposition would obtain in all soils, since the presence of an abundance of nitrates would under some circumstances throw the influence towards a growth of the succeeding crop. There is thus presented a problem in crop rotation. If the influence of a certain kind of plant on the formation of nitrates, after its removal, holds for soils other than the one in the present experiment, this influence may be an important factor in crop rotation. That other, and under some conditions more powerful influences than nitrate formation obtain is also indicated by this experiment.

345 - The Changes in Soil Due to Manuring.

1. MASCHHAUPT, J. G. Onderzoek naar de veranderingen, welke door plant bemesting in den bouwgrond teweeggebracht worden, I. Rijkslandbouwkundig Instituut te Groningen. — *Departement van Landbouw, Nijverheid en Handel, Directie Landbouw, Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouwkundige Instituut*, No. XII, pp. 48-71 (66-71) + figs. 8. The Hague, 1912.

2. HUDIG, J. Het ontstaan van schadelijke afwerkingen in humusrijke aarde als gevolg van bemesting minerale stoffe. Rijkslandbouwproefstation te Groningen, pp. 83-138 (132-138) + 3 figs.

G. J. Mulder (*Scheikunde der bouwbare aarde*, III, 497-498) has already drawn attention to the fact that in manuring more has been paid to the effect on the crop than to the effect on the soil. J. Sjollesma and Hudig (*Verslagen van landb. onderzoekingen der Rijkslandbouwproefstations*, X, 1909) suggest that the so-called "oat disease" recorded on the reclaimed land of the provinces of Groningen and Drenthe be attributed to the injurious influence exercised upon the soil by vegetation and the manuring.

1. — Taking this and his other previous researches (*Id.*, XI, 1), as a basis, the writer has undertaken a systematic study of the change in soil induced by individual cultivated plants and by the various kinds of manures. In the first part of his researches, he studied potatoes and oats, which he grew in 16 paraffined zinc vessels, each containing 10 kg. (22 lbs.) of light sandy loam. The series consisted of 4 lots respectively with 3 gr. of nitrate of soda, 2.5 gr. of sulphate of soda, 1.5 gr. of nitrate of ammonia and nothing; three vessels of each lot respectively planted with the above-named plants and the fourth lot not planted. After the first crop was gathered, the soil was stirred in the air and analysed. The second year, the soil was replaced in the vessels and cultivated in the same manner, but the amount of fertilizer given was halved, corresponding to about 450 lbs. of nitrate of soda per acre.

The analysis of the soil was limited to the determination of the amount of deposition of the fine clay; 100 gr. of each soil (dried) were taken

ion in a cylinder and repeatedly stirred up; then the volume was 500 cc., the contents of the vessels were again stirred and left to settle; the cylinders were photographed by refracted light. The results observed after the first year agreed with those of the second, the changes taking place after two years of the experiment are consequently still greater. The results were as follows: the most satisfactory deposition occurred in the non-cultivated pots.

The deposition was least satisfactory in the cultivated pots of the soda lot, intermediate in the nitrate of ammonia lot and that of the nitrogen, and much more rapid and complete in the lot with sulphate of ammonia.

The effect of the three plants was in the following order: potatoes, wheat, oats.

Into consideration the lime content of the aqueous extract of the plants we have:

	mg. lime per 100 cc.	1910	1911
<i>nitrate of soda</i>			
potatoes	8.2		6.7
wheat	10.6		8.7
oats	12.3		8.5
control	13.0		11.8
<i>sulphate of ammonia</i>			
potatoes	13.1		12.4
wheat	13.6		14.4
oats	14.4		13.5
control	14.4		15.7
<i>control</i>			
potatoes	10.1		8.7
wheat	11.9		9.2
oats	12.4		8.9
control	11.0		10.6
<i>nitrate of ammonia</i>			
potatoes	9.6		10.1
wheat	10.9		11.1
oats	12.9		10.8
control	12.5		13.3

agreement between the lime content of the aqueous extract of the plants and the facts quoted as to the deposition of the fine soil is evident, being taken as the index of the structure of the respective soils. The same agreement is confirmed by the fact that, on equalizing the results of the various cylinders by means of the addition of chloride of calcium, the differences in the manner of the deposition of the clay dis-

For the completion of these researches, the writer proposes to the crops and determine the lixiviation action of the atmospheric pitations.

2. — The above-mentioned researches of Sjollesma and of the indicated as the cause of the "oat disease" the unfavourable effect on humous sands by the long-continued application of manures containing lime, including basic slag, as well as of nitrate. In these researches the writer has studied the alterations which in the soil.

To this end, not having succeeded like the American in separating out definite chemical bodies, he began with ordinary soils which had not been limed; from these he separated the organic and also, by means of solution in soda and fractional precipitation calcium chloride, two humic substances I and II; these three obtained respectively 35.31, 48.29 and 35.65 per cent. of organic matter, 1.14, 12.77 and 2.56 per cent. of lime. Mixtures of these substances and alluvial sand, Z, were placed in 32 pots; the amount of sand was (44 lbs) or 13.4 kg. (29.5 lbs), according to whether only the substances I and II were added or whether O also was added; the amount of I and II were 100 gr. and 600 gr. or multiples of these; the amount of O was 3.4 kg. (7.5 lbs.) or submultiples of this. In 1908, 1909, 1910 and 1911 oats were grown with the application, year, of basic slag, sulphate of potash and nitrate of soda and of with monopotassium phosphate in place of the slag; the last year ground was specially treated with fertilizers containing manganese with sulphate and nitrate of ammonia. The following results were observed:

- a) II mixed with Z and with Z and O caused the "disease"
- b) I caused the "disease" mixed with O only, even in the pot of $\frac{1}{2}$ per cent.
- c) The diminution of the crop due to the "disease" is very
- d) Manganese sulphate, manganese hydroxide, and sulphate of ammonia have much curative action.

The soil sickness caused by chemical (alkaline) treatment alone to be due to a characteristic belonging to humic substances in fact, besides having been recorded in other soils (sandy, in Holstein) this phenomenon can be artificially produced. If a humous sand and sugar humus is treated with lime or soda and nitrate this soil after some years becomes sick. The same thing occurs on pure sand to which a solution of pyrogallol is added; the latter has the property, belonging also to humic substances, of absorbing from the air in an alkaline medium.

Conclusions:

I. The injurious action of alkaline manuring upon sandy soils, to which is attributed the oat disease, is due to the formation of unknown humic bodies, which are chiefly found in those parts of the organic matter which are insoluble in alkalis.

Owing to the use of chemical manures, the study of humic substances is especially important. It is therefore much to be wished that absences in the cultivation of humiferous soils should be studied from a chemical point of view. The study of the effects of chemical substances upon humic substances is also of great importance for agricultural bacteriology.

Efficiency of Soluble Manures in Dry Years.

ABON, F. Efficacité des Engrais solubles en année sèche. Résultats obtenus dans des expériences et de démonstrations en Algérie et Tunisie en 1911-1912. *Revue Agricole et Viticole de l'Afrique du Nord*, Nos. 49 and 50, pp. 151-155 and 6. Algiers, February 15 and 22, 1913.

Experiments with mineral manures were made on the following cereals (wheat, barley and oats), vines, tobacco, cotton, fruit trees etc.

The experiment fields have not yielded any results owing to the causes:

The crops were not weighed by the experimenters, either through carelessness or because the yields seemed too insignificant.

The yields were next to nothing owing to late sowing in badly drained soil, to the unusual drought of the year and to the sirocco of the first of May.

Too tardy spreading of the nitrate of soda.

Among the experiments which gave results, the following are the most valuable.

Cereals: Results per acre.

1) Hard wheat: Loam (Algiers).

Manure	Yield per acre	Excess above control	Value at 122 1/2 per cwt.	Manure	Net profit
lbs.	lbs.	lbs.	£ s d	£ s d	£ s d
control	606	—	—	—	—
calc. slag 446	856	250	1 7 0	11 3	15 8
calc. slag 446	1100	494	2 13 5	1 0 10	1 12 7
nitrate of soda 89					
calc. slag 146	1213	606	3 5 5	1 5 8	1 19 9
nitrate of soda 134					
calc. slag 446	1471	865	4 13 4	1 10 6	3 2 10
nitrate of soda 178					

2) *Hard wheat: Loam (Algiers).*

Plot	Manure	Yield per acre		Excess over control	
		grain	straw	grain	straw
	lbs.	lbs.	lbs.	lbs.	lbs.
1	Superphosphate. . . 267	455	1338	—	—
2	Superphosphate. . . 267	606	1516	151	178
	Nitrate of soda. . . 89				
3	Superphosphate. . . 167	735	1605	280	267
	Nitrate of soda. . . 178				

3) *Hard Wheat (Native school at Ben-Chicao).*

Plot	Manure	Yield		Excess over control		Value of excess over control		Manure
		grain	straw	grain	straw	£	s	
	lbs.	lbs.	lbs.	lbs.	lbs.	£	s	£ s d
1	Control —	758	1160	—	—	—	—	—
2	Basic slag 357	848	1427	89	268	11	7	10
3	Sulphate of potash . 223	803	1338	45	178	6	1	2 10
4	Nitrate of soda . . . 223	892	1427	134	268	16	4	1 4 4
5	Slag and nitrate . . —	1248	1695	990	535	2	16	9 1 14 4 1
6	Slag and potash. . . —	1115	1427	357	268	2	0	5 1 13 1
7	Potash and nitrate . —	1160	1784	401	625	2	7	10 2 6 10
8	Slag, potash, nitrate of soda —	1338	2498	580	1338	3	12	2 2 17 1

Manure	Price of manures per cwt.	Yield per acre		Net profit. Barley at 8s 1d per cwt.			
		grain	Excess over control no. 1				
	lbs.	s	d	lbs.	lbs.	s	d
erphosphate	267	3	7½	1182	250	6	5
ate of soda	27	12	1				
erphosphate	267	—	—	1102	170	3	6
rol No. 1.	—	—	—	932	—	—	—
erphosphate	267	—	—				
namide	89	11	8	923	0	—	—
					over control no. 2		
erphosphate	267	—	—	825	85	—	nil
namide	89	—	—				
rol No. 2.	—	—	—	740	—	—	—
erphosphate	267	—	—				
cate	133	7	3	714	—	—	—

1) Carignan vine: flat gravelly soil (Algiers).

Mature	Yield	Excess over control	Value at 7s 3d per cwt.	Degrees of the must	Net profit
	lbs.	lbs.	lbs.	£ s d	£ s d
phosphate. . . . 357	10 955	—	—	11.50	—
phosphate. . . . 357					
ate of soda 178	14 078	3 122	10 2 2	—	9 3 7
phosphate. . . . 357					
bate of potash . . . 178	12 044	1 142	3 10 7	12.00	2 13 3
phosphate. . . . 357					
bate of potash . . . 178	14 452	2 560	11 6 10	12.90	9 10 11
ate of soda 178					

2) Loam poor in lime (Algiers).

Plot	Manure	Yield of grapes	Excess over control		Value at 10.81d per gal.	Manure and carriage			Net		
			grapes	wine							
		lbs.	lbs.	gals.	£	s	d	£	s	d	£
1	Control	17 892	—	—	—			—			
2	{ Organic manure: 892 lbs. per acre, at 45 per ton. .	18 624	731	56.5	2	11	4	2	0	1	
3	{ Basic slag: 446 lbs. at 42 16s 5d per ton. Nitrate of soda: £12 1s 11d per t.	22 504	4 612	356.4	16	0	11	1	10	5	14

3) Carignan, Morastel and Alicante vines: loam on clay subsoil (Médak).

Plot	Manure	Yield of grapes	Degree of must	Excess over control		Value at 1s 1.8d per gallon			Manure			
				grapes	wine	£	s	d				
		lbs.	lbs.		lbs.	gals.	£	s	d	£	s	d
1	Control —	8 654	14°	—	—	—	—	—	—	—	—	—
2	Basic slag 357 Sulphate of potash 134	9 992	—	1 338	986	5 18	1	1	3	9		
3	Sulphate of potash 134 Nitrate of soda . . 134	10 706	—	2 052	1 650	9 10	0	1	7	11		
4	Basic slag 357 Nitrate of soda . . 134	10 884	—	2 230	1 784	10 5 4	1	4	8			
5	Basic slag 357 Potash 134 Nitrate of soda . . 134	11 598	14.5°	2 944	2 319	13 7 0	1	18	21			

argentan vine, loam, poor in phosphoric acid and in calcareous compounds, irrigated (Philippville).

Manure per acre	Yield of grapes	Excess over control		Value at 12 1/2d per gallon	Manure at 12s 1d per cwt.	Net profit
		grapes	wine			
	lbs.	lbs.	gals.	£ s d	£ s d	£ s d
rol.	9 403	—	—	—	—	—
lbs. nitrate of soda . .	11 116	1 713	138	6 19 3	1 7 6	5 11 9
lbs. nitrate	10 295	892	71	3 11 10	2 0 11	1 10 11

Forage Plants: Results per acre.

Five-years-old lucerne; loams, insufficient irrigation (Algiers).

Manure per acre	Dry hay (total of 3 cuts)	Excess over control	Value of excess at 4s per cwt.	Net profit
	lbs.	lbs.	£ s d	£ s d
rol.	8 341	—	—	—
lbs. superphosphate . .	10 036	1 695	3 1 0	1 14 0
lbs. basic slag	10 616	2 275	4 1 10	2 14 10

in the above experiments the following conclusions may be drawn :

— Mineral manures are more efficient than organic manures. the nitrogenous manures used (organic manures, oil-cakes, cyartrate of soda) nitrate of soda yielded the best results. In most other nitrogenous manures did not give any excess over the control.

I. — The manures must be ploughed in early, excepting the nitrate of soda which should be given as a top-dressing : in February in the north, in December one-third and in February or March two-thirds in the south. For other crops the nitrate of soda is to be ploughed in with phosphatic and potash manures.

II. — There is a minimum of moisture below which manures act but do not give no profits. According to M. Chouchak, in Crimea if the soil is less than 200 mm. (8 inches) from November to the end of June soils containing less than 15 per cent. of moisture, manures increase yield by very little or nothing.

V. — Phosphatic manures are insufficient in poor soils or in those moderately rich in nitrogen. They must be completed by nitrate of soda or by sulphate of potash.

347 - **Fertilizers and Manures in Canada.**

- (1) Emslie, L. E. The Use of Commercial Fertilizers in Canada. — *Commissioner of the International Institute of Agriculture in G. T. E. Espinasse, Commissioner of the International Institute of Agriculture in G.*
 (2) Nunick, R. C. Agricultural Survey, 1911. — *Commission of Conservation, G. Report of the Third Annual Meeting, held at Ottawa, January 6th 1912, pp. 106 tables. Montreal.*

(1) *The use of fertilizers in Canada.* — The use of commercial fertilizers in Canada has scarcely passed the initial stage, and in the Maritime Provinces, more especially in the fruit and potato-growing districts, fertilizers have been popular for years. Ontario and Quebec have, during the past five years, been giving the subject more attention and may be expected to rapidly increase their consumption from this stage. British Columbia quickly learned the value of fertilizers and takes high rank as a consumer. This year a V.I. firm shipped a carload of fertilizer to Dawson City in the Yukon. The Provinces of the middle-west will not be heavy consumers for years to come, although the use of fertilizers there has commenced, especially amongst market-gardeners and potato-growers, but they are being used to a small extent by grain-growers. The prevailing freight rates necessarily add greatly to the cost of the fertilizer, and aggravate the difficulties of pioneer work. In the younger provinces of Alberta and Saskatchewan, the interest in the fertilizer question is greater than in Manitoba. This may be explained by the fact that in recent years there has been a very large emigration of United States European farmers to Alberta and Saskatchewan, men who were already familiar with the use of fertilizers.

The following table shows the principal fertilizer materials imported into Canada during the years ending June 30th, 1904, and Feb. 29th, 1912, respectively, and a comparison of the two years indicates the increase which has taken place in the intervening period:

	12 Months ending June 30th, 1904		12 Months ending Feb. 29th, 1912	
	lbs.	\$	lbs.	\$
Fertilizers (manufactured)	—	134 063	—	41
" (unmanufactured)	—	19 155	—	—
Muriate and sulphate of potash	1 836 315	33 740	6 840 138	12
Kainit and other potash salts	726 917	5 868	985 750	—
Acid phosphate	285 707	15 248	1 348 422	6
Phosphate rock	—	8 000	—	4
Blast furnace slag	—	6 808	—	11
Sulphate of ammonia	186 084	5 485	520 863	1
Nitrate of soda	12 849 764	258 578	58 711 867	8
Nitrate of potash	1 978 972	86 308	2 273 437	11

In the case of "Manufactured Fertilizers" and a few other it has been impossible to get the quantities, the value only being "Unmanufactured" fertilizers represent those materials which not be properly identified, and the decrease in the amount of the

a).— *Area Surveyed.*

	Nova Scotia	Prince Edward Island	New Brunswick	Quebec	Ontario	Mani- toba	Saskat- chewan	Alberta	British Colum- bia
ms	100	100	100	200	300	100	87	85	140
age	16 893	10 992	13 991	30 552	33 340	39 999	35 303	22 713	62 428
acreage	5 958	8 220	6 836	19 459	24 634	28 045	24 616	16 222	14 761
of total	33	74	49	64	74	70	70	71	24
age	1 072	2 508	1 750	5 640	10 917	26 003	24 149	12 855	13 652
of field	18	30	25	34	44	93	98	78	25
acreage	277	510	249	806	3 126	205	—	89	1 263
of field	5	6	3	4	12	0.62	less than 1/2	0.54	9
pasture	4 609	5 196	4 837	13 014	10 596	1 757	—	—	9 846
of field	77	62	71	66	43	6	1.8	21	67

b) *Use of Farm Manures.*

(Figures as percentages).

	Nova Scotia	Prince Edward Island	New Brunswick	Quebec	Ontario	Mani- toba	Saskat- chewan	Alberta	British Colum- bia
farm ma-	100	100	100	100	100	most farmers	78% use some	70	88
no care	22	64	44	76	44	77	the majority	—	55
care	11	—	15	—	3	—	—	—	—
	59	34	29	20	25	14	10	5	18
	8	—	—	4	15	—	11	—	—
ing the	—	—	—	—	—	16	—	—	—
ing the	—	—	—	—	—	4% burn some	—	—	—
	—	—	—	—	—	—	22	many	—

indicate better classification facilities in recent years. "Acid phosphate" (non-medicinal) would seem to include a large proportion of fertilizer purposes, since the value given is much in excess of the value of this material as a fertilizer. "Nitrate of Soda" is at present the popular form of nitrogenous fertilizer, but the bulk of this material is exported and is used for manufacturing purposes, and it is yet impossible to estimate even approximately the amount used for fertilizer purposes. "Nitrate of Potash" is also almost entirely used for industrial purposes, its use as a fertilizer being very limited.

No figures are available to show the production of fertilizers in Canada itself, but most of the slaughter-house tankage and bones, formerly exported, is now, by the addition of potash, being converted into fertilizer for home consumption.

The importation of other fertilizer materials gives, however, a sufficient indication of Canada's increasing fertilizer consumption.

(2) *The use of farmyard manure in Canada.* — From the results of the agricultural conditions found by the Commission of Investigation of Canada in the localities where the agricultural survey was conducted in 1911 the data on the use of farmyard manure given in the previous page are extracted.

348 - A Potash Salts Deposit in the United States of America.

DOLNEN, C. E. The Searles Lake Potash Deposit. — *The Engineering and Mining Journal*, Vol. 95, No. 5, pp. 259-261 + fig. New York, February 1913.

Many potash salts deposits have been alleged of late in the United States, but apparently the best prospects are in the Searles Lake, a floor of an ancient lake which lies between the State and Argus just south of the boundary line between Inyo and San Bernardino Counties in California. The deposit is on and under the bottom of the lake, the area of which is about 40 000 acres. Potassium was not looked for, but sodium carbonate in such condition that it could be readily converted to soda ash.

Borings were made over the salt-bed area at intervals of from half mile to one mile and determined the following facts: that the thickness of the soluble-salt bed is a little over 70 ft.; that the first 10 ft. is mostly sodium chloride with a greater or less amount of impurities in the form of sodium sulphate and small amounts of sodium carbonate and borax; that the underlying 47 ft. is composed of strata of mixed sodium chloride, sulphate, carbonate, bicarbonate and borax, together with potassium chloride. All of the deposit is coarsely crystalline in structure, much honeycombed, and the interstices are filled with a brine saturated with all of the salts of the deposit except sodium bicarbonate.

This brine has a specific gravity of 1.3. The analyses of the brine show remarkable regularity of content throughout the whole of the underlying beds; that is below the first 23 ft., 100 lbs. of this brine on the average, dissolved salts in the following amounts:

	lbs.
sodium chloride	16.77
» sulphate	5.46
» carbonate	4.61
» baborate (anhydrous)	1.32
potassium chloride	4.49
Total	32.65

the salt obtained by evaporating to dryness and calcining the product and combined water, analyses :

	per cent.
sodium chloride	51.3
» sulphate	16.7
» carbonate	14.1
» baborate	4.9
potassium chloride	13.8

The brine constitutes approximately 18 % of the total weight of the deposit. The brine carrying the more valuable salts occurs in the sodium-chloride bed. The underlying bed averaging approximately 47 ft. thick, and the area explored being 12 sq. miles, the total weight of the underlying bed is then approximately 800 000 000 tons, and 18 % is 144 000 000 tons. As the brine carries an average of 4.49 % potassium chloride, the tonnage of that salt in solution is then 6 465 600 tons. The brine also carries 1 900 000 tons of anhydrous borax, equivalent to 60 tons of commercial borax ; further the brine carries 6 630 000 tons of sodium carbonate.

The solids of the deposit below the sodium-chloride bed have the following average analysis :

	per cent.
insoluble (sand, etc.)	1.44
sodium chloride	45.90
» sulphate (anhydrous)	22.80
» carbonate (ditto)	16.57
» bicarbonate	6.50
» baborate (anhydrous)	2.32
potassium chloride	3.64

The total amounts of the valuable salts in solid form are then :

	tons
sodium carbonate	108 500 000
» bicarbonate	42 700 000
» baborate (anhydrous)*	15 200 000
potassium chloride	23 900 000

equivalent to 27 300 000 tons of commercial borax.

That the brine is free to flow through the solids is shown by boring a hole into the material. A 6-in. hole bored through the deposit and cased

through the sodium - chloride bed will yield not less than 3 000 tons of brine per day.

At present the evaporation-power of the air in July and August is about 1 in. per day of saturated brine; the actual evaporation is much less, as the surface is only kept damp by capillary action. In this case, the pumping of the brine would check this movement, and any brine flowing into the bed would dissolve out more of the salts and so check the supply of brine.

The brine alone is alleged to contain sufficient potassium chloride to supply the United States with that salt at the present rate of consumption for 16 years, supposing there to be no renewal of the brine. With a deposit as above suggested the deposit is stated capable of supplying potassium chloride at the present rate of consumption for at least 70 years.

349 - The Use of the Phonolite of the Bohemian Mittel Gebirge Fertilizer.

SEEMANN, F. Ueber die Verwendung der Phonolite des böhmischen Mittelgebirges zu Düngszwecken. — *Landwirtschaftliche Jahrbücher*, Vol. XIII, Part 4, pp. 1-10, Berlin, 1913.

Since 1908, the West German Railway Co. (West deutschen Eisenbahn-gesellschaft) and, more recently, the Rhenish Potassium Works (Rheinischer Kalisilikatwerken) the Kempenich Phonolite Works of the Graf Gleichen Mining Co. (Kempenicher Phonolitwerken der Graf Gleichen), and the Leuchtenberg Mining Co. (Gesellschaft Leuchtenberg) have put on the market under the names of "phonolite meal", "silicate of potash", "eifelite" and "vulcophonolite" potash manure made from crushed rocks from the Eifel. It appears that, in spite of the negative results obtained in many Agricultural Experiments and Institutes, the use of this new fertilizer is increasing. Phonolite from the Bohemian Mittelgebirge is also placed on the market.

The writer, basing his opinion on already existing analytical and mineralogical data, comes to the conclusion that the phonolite of the Mittelgebirge of Bohemia is, from its chemical and mineralogical position, much less suitable as a fertilizer than the leucitophyre of the Eifel. For while the potassic constituent of the latter is leucite, which is very soluble and particularly rich in potash, that of the former is sanidine, a comparatively insoluble substance much poorer in potash. Leucitophyre possesses a total potash content of 9 or 10 per cent. and a soluble potash content of about 3.5 per cent., while the amount of potash usually present in the Bohemian phonolite is only 4 to 6 per cent., rarely amounting to 7 per cent., and that of sanidine never exceeds 2 per cent. and is as a rule only 1 per cent. The addition of calcareous salts or humiferous matter to increase the solubility of the potash is less satisfactory in the case of the phonolite than in that of the leucitophyre.

the writer, in conclusion, warns his readers that more care is required in obtaining and applying phonolite meal than is needed in the case of leucitophyre meal.

The deposits in question are those of natrolitic phonolite of Marienberg and Steinberg near Aussig, and the tephritic phonolite of Ziegenberg and Gross-priesen.

Catalytic Radio-active Manures

PEAUX, L. Les engrais radioactifs. — *La Vie Agricole et Rurale*, Year II, No. 9, 242-243. Paris, February 1913.

Natural trials to test the efficiency of catalytic radio-active (1) were carried out at the Agricultural School of the Pas de Calais. Preliminary pot experiments with oats and crimson clover (*Trifolium incarnatum*) gave positive beneficial results whenever the radio-manure was employed. In the field trials the radio-active manure mixed with other common fertilizers, forming 5 per cent. of the and the application per acre varied from 22 to 44 lbs. Some of the results obtained were as follows:

	With radio-active manure	Without radio-active manure
Oats	87 bushels p. acre	76 bushels p. acre
Mangels . . .	22.2 tons " "	21.5 tons " "
Sugar beets .	8.8 " " "	7.7 " " "

In the case given above the oat crop was increased 15 per cent., in neighbouring plots, where the dressing of super was replaced by the increase was nil. The mangels and sugar beets both gave increased yields, and on analysis no difference in composition could be detected between those grown on the check plots and those grown on plots receiving the radio-active manure, but the sugar beets on the plots matured earlier.

The Intensity of Light and its Effects on Vegetable Assimilation.

1912, M. A. La luminosité et l'assimilation végétale. — *Comptes Rendus de l'Académie des Sciences*, Vol. 156, No. 5, pp. 368-370. Paris, February 1913.

In laboratory experiments on carbon assimilation it has been demonstrated that assimilation is more active in direct sunshine than in daylight, and, by analogy, it has been assumed that the same is good for vegetation under natural conditions. Of course under natural conditions, the plants exposed to diffused daylight are also exposed to more humid conditions generally, and the larger supply of water than counteracts the effect of the greater light intensity. But that the water supply was always sufficient, what is the effect on the action of light of high intensity? In order to test this point a crop

of lucerne was set aside at Mendon during the three summers of 1911 and 1912. Part of it was given no special treatment, while the other part received 40 litres of water per square metre every 7 days, so that the soil never dried out. The yields of dry matter per square metre per day were as follows:

	Under natural conditions	Watered
1910	5.24 grams	10.56 grams
1911	1.24 " "	7.60 " "
1912	3.12 " "	9.42 " "

During the years 1910 and 1912 the sky was overcast during the greater part of the summer, whilst 1911 was a season of bright sun and drought. The yields under natural conditions show the relative importance of light intensity and water supply in plant growth, but when the latter factor is eliminated by artificial watering, the more intense light appears to have an unfavourable effect on the production of vegetable matter.

This apparently contradictory result obtained when a laboratory experiment is extended to field conditions arises from the fact that the laboratory plants are necessarily kept in an artificial atmosphere relatively richer in carbon dioxide in order that it should be possible to detect variations in the percentage of that gas caused by the process of carbon fixation; whilst in the natural atmosphere the amount of carbon dioxide present is so small that the solar radiations, be they diffuse or direct, are always sufficient to make the best use of the carbon dioxide. In other words, carbon assimilation is limited by the amount of carbon dioxide in the air and not by the intensity of the solar rays.

352 - The Effect of Weak Acids on Germination.

PROMSY, G. Role des acides dans la germination (a note presented by M. G. Bonnier). — *Bulletin des Séances de la Société Nationale d'Agriculture*, Year 1912, 5 pp. 916-922. Paris, 1912.

Citric, malic, tartaric, acetic, hydrochloric and sulphuric acids were employed, in solutions varying from 0.05 to 0.5 %, and seeds with succulent and dry pericarps. Seeds with succulent pericarps, such as tomatoes, would under natural circumstances germinate in an acid medium, and these all profited to the largest extent by the external application of acid during germination. Seeds of non-acidic fruits sometimes assisted and sometimes hindered in germination by an acid medium, the effect being apparently due to the action, favourable or otherwise, of the acid on the diastatic activity of the seed.

The favourable action of the acid was obtained not only by germinating the seed in an acidic medium, but also by a preliminary sowing of the seed in acid and subsequent sowing in a neutral medium; a small quantity of acid absorbed during the steeping was sufficient to modify the vegetative growth in a remarkable manner. If the seed was subsequently sown in an alkaline medium, the beneficial effect

acid was diminished, but still perceptible; certain nutritive materials had a neutralizing effect.

The absorption of acid was greatest during the first stages of germination, varied directly with the concentration of the solution, and apparently independent of the action of light. The absorbed acid have been rapidly transformed after absorption, as the internal respiration of the seedlings was not increased, a further proof of its rapid disposition being indicated by an increased respiration of the seed.

While light did not appear essential to the decomposition of the acid, it produced a favourable influence on its assimilation and utilization.

The absorbed acids not only modified the metabolism of the seedlings but also their morphology; on the one hand they retarded the lignification of the fibrous tissue and the lignification of the wood, on the other hand increased the volume of the central cylinder and the growth of the conductive tissue.

The Selection of Hungarian Wheat.

RANKNER, ÉMILE (Director of the Royal Hungarian Station for Plant Breeding at Magyarbuda). *A magyar búza nevelése*. — *Közelekk*, Year 23, Nos. 11 and 15, pp. 330-333 and 407-408. Budapest, February 8 and 15, 1913.

The question of the systematic improvement of Hungarian wheat for some years become of increasing importance, for though the native wheat is suitable to the climate, as it ripens early and resists the winter, it does not supply the needs of the country, for its yield is poor and it only lodges much, but is greatly predisposed to the attacks of rust. Numerous and repeated experiments made with the acclimatized varieties, Hybrid Treasure and Prolific, have shown that these cannot withstand very severe cold; thus, in spite of their superior quality, they are not as substitutes for Hungarian wheat. Now, if by means of rigorous selection the average wheat yield throughout Hungary could be increased to 3 bushels per acre (at present, it does not exceed $15 \frac{1}{2}$ to 17 bushels per acre) the 9 162 150 acres under wheat would give an extra yield of 27 million bushels, representing an increase in the revenue of the country of £4 000 000 to £6 000 000, reckoning the price at only 36s 6d per quarter.

In 1905, the Royal Hungarian Institute for Plant Selection at Magyarbuda began its first selection experiments in the different districts of the country, and then persuaded the owners of three large estates, Árpád-ná, Bankut and Csorvás to carry out experiments on larger areas. As Hungarian wheat, like other unimproved varieties, is not uniform, but is a mixture of more or less different types, it was necessary to adopt pedigree breeding. The task consisted, on the one hand of selecting plants with the best characteristics from the experiment fields, and on the other of reproducing selected types superior to the parent variety. The choice of types was made with a view to securing early maturing varieties with a heavy yield of grain, strong-strawed and resistant to frost. The

pedigree method proved very successful, for even during the experiment of the first year the plants growing on the plot of the parent plant were a uniform type, while those from other plots showed different characters. All the parent stems were numbered and registered.

Last year the Arpádhalm estate had reached No. 615 in selection of parent ears and had 14 selected types obtained from the first experiments only (begun in 1905); these were followed later by numerous new types.

The following figures give the results obtained in 1912 from pedigree Arpádhalm wheat:

Name of the estate	Number of selected type	Average yield of grain per acre		
		Selected Wheat	Parent Variety	Russ. the parent
		lbs.	lbs.	lbs.
Arpádhalm	178	1 649		10
"	217	1 941		28
"	219	2 038		8
"	239	2 281	1 546	7
"	246	1 860		30
"	253	2 097		31
"	266	2 196		29
Zoltántér	16	1 841	1 582	20
Szendrey	19	1 910	1 477	4
"	117	1 666		11
Lajosváros	17	2 025	1 407	6
Peresznye	1	2 561		9
"	16	2 517	1 633	8
"	19	2 637		10
"	178	2 364		6

Thus the yield of the pedigree wheat is much larger than that of parent variety and the former grows as well in other districts as in those where the experiments were made, for selected Arpádhalm wheat produced a magnificent crop at Peresznye.

Finally, in order to fix the characters of the selected types, the institute began hybridization experiments in 1909. Thus for example an early variety very susceptible to rust and with a small yield, was crossed with a late, more productive, and rust-resistant variety, or one of

with weak straw was crossed with a commoner type with stronger etc. At the Institute experimental ground 1886 plots were sown from hybrids obtained in the preceding years; further, the cross last year furnished 1212 parent plants. The experiments are being continued with every possible combination, it is hoped that a pedigree Hungarian variety of perfect quality will be produced.

Comparisons of Yield between Hybrids and Selections in Oats,

by H. H. in *The American Breeder's Magazine*, Vol. III, No. 4, pp. 289-292, Washington, 1912.

In the data obtained in the plant breeding work at the Cornell Experiment Station during the past 5 years, the yielding power of oat strains of oats obtained on the one hand by hybridisation, and on the other by selection is compared. The trials were all made in rows, 1 rod in length, repeated a number of times, as this method gave more correct results than one large plot repeated only once. The best strains from both sources were isolated in 1907 and 1908, then tested during the 3 years 1909-11; they produced the following average yields:

10 best hybrids		10 best selections
bushels per acre (1)		bushels per acre
51.7	.....	47.3
51.8	.....	49.4
52.1	.....	49.5
52.4	.....	51.1
53.1	.....	52.1
53.6	.....	54.5
54.0	.....	54.6
54.3	.....	57.3
55.0	.....	57.3
62.1	.....	58.6
Average	54.0	58.1

In 1910 and 1911 a number of well-known commercial varieties included in the trials and comparative figures for the two-years are as follows:

Hybrids	59.0 bushels per acre.
Selections	58.1 " "
Varieties	50.8 " "

In both these cases, and in all the results taken as a whole, the hybrids gave slightly better yields than the selections, though the differences are small and vary from year to year. The data also furnish considerable evidence on the value of certain plants in hybridisation, of 10 of the best hybrids having a common parent.

The standard bushel of oats in the United States weighs 32 lbs.

(Ed.)

355 - **A Variety of Maize with Silks maturing before the Tassel**

COLLINS, G. N. — *U. S. Department of Agriculture, Bureau of Plant Industry, Com.*
No. 107, pp. 1-11. Washington, February 1912.

In the varieties of maize cultivated in the United States the anthers usually open before the silks (stigmas) appear on the same plant, the pollen is still falling when the silks are in a receptive condition. Even where high and constant winds prevail at flowering time, this results in a large proportion of self-pollinated seed. In maize, self-pollination reduces the vigour of the plants that any means by which it can be avoided or reduced is worthy of consideration, and the best means of doing so to produce a protogynous plant, as in that case, should self-pollination fail, there is still the chance of self-fertilization.

Many attempts have been made to develop this habit in some of the improved varieties, but so far without success. In January 1911 two ears of red pop corn were purchased at Granada, Spain, by a member of the Staff of the Bureau of Plant Industry and when planted in Maryland the following season produced plants almost every one of which was protogynous. The ears of this variety are so small that it is probably of no economic importance, except perhaps as a pop corn, and moreover, the subsequent behaviour of a variety cannot be inferred by its behaviour the first year; but it seems certain that the protogynous tendency exists in a marked degree, and the strain may be valuable as breeding material. Only a small quantity of seed is on hand but a few grains can be supplied to those wishing to make a study of this variation and to assist in determining its economic importance.

356 - **Investigation of the Relation between Anatomical Structure and Physiological Characters in Oats.**

JANUSZEKINE, O. W. and VAVILOV, N. Anatomilchaskoe issledovanie mieskikh ovsy v svyazi s voprosami o sootnoschenii fiziologicheskikh svoystv s anatomicheskimi koefitsientami — *Jurnal Opetnoi Agronomii* (Russisches Journal für Experimentelle Landwirtschaft), Year XII, Part 6, pp. 830-861 (855-861). St. Petersburg, 1912.

Of late years, the question of the importance of the size of leaf cells, particularly the size of stomata in distinguishing the different varieties of cereals and other cultivated plants has been much brought forward by the works of Prof. V. Kolkunov of Kiev. (1). According to the latter, there is an intimate connection between the anatomical structure of plants (the size of the stomata) and the intensity of different physiological functions such as the assimilation of carbonic acid, transpiration energy, osmotic pressure of the cell sap, and indirectly in the case of cereals, the duration of the vegetative period. In other words: Prof. Kolkunov shows by his experiments that the degree of drought resistance, early or late maturity, winter resistance, etc., depends upon the anatomical peculiarities of the plant and especially on the size of its stomata.

(1) See No. 1621, B. Dec. 1912.

The article in question gives an anatomical examination of some selected varieties of oats which show various morphological and physiological characters in order to throw light on the magnitude of the differences which exist in oats in this respect. It was also interesting to compare the anatomical differences with the physiological characteristics of the different varieties, especially as oats were hardly touched on in Prof. Kolosov's investigations.

For material for this purpose pure lines of oats were taken, these being obtained by individual selection from various mixed German and West Prussian varieties. The lines chosen for the experiment were sown in the autumn of 1911 and 1912 in plots on a levelled piece of land belonging to the Central Agricultural Institute, each plant being given 14 sq. in. standard area.

The leaves for measuring were gathered from definite nodes of the culms from the middle of the plots as soon as the leaves ceased growing. The portions of the leaves at two-thirds of the length (measuring from the base) were selected for measurement. The stomata on the upper surface near the midrib were measured. To obtain the average size of the openings of the stomata, not less than 1000 measurements (on 50 leaves) were taken for each variety. In addition to the length of the stomata their number in the field of the microscope was also reckoned. (Eyepiece, Objective 4, Reichert System).

Of the 17 varieties of oats investigated belonged to the group with spreading grains and with the branches of the panicle spreading in all directions (*Avena sativa* L.).

There is no uniform system for the classification of cultivated oats, but the author gives a short morphological description of the varieties he investigated.

In the large table the results of the investigations of 1911 and 1912 are given. From the first column of this it is seen, as would *a priori* have been supposed, that the size of the stomata can in the case of oats, as in that of other cereals, be taken as a variety characteristic.

In the present case, where 17 varieties of oats were dealt with, two groups can be distinguished by the size of the stomata:

I. Large-celled group:

A-4113 Mendago, A-321 Hudan, C-311 Brie

Average length of aperture:

for the top leaf, 1911 0.063 mm.

" " third " 1912 0.0735 "

II. Small-celled group: the other 14 varieties.

Average length of aperture:

for the top leaf, 1911 0.054 mm.

" " " 1912 0.067 "

The inheritance of differences in the size of the stomata is proved by the fact that variations occurred in the same direction for two consecutive years in both the experimental and the control plots.

TABLE I. — Results of the 1st

Variety	Leaves of 1st node (reckoning from above) in 1911				Leaves of 2nd node (from above) in 1911				Leaves from 3rd
	Length of aperture of stomata in field of microscope μ	Number of stomata in field of microscope	Area of leaf sq. cm.	Length of aperture of stomata μ	Number of stomata in field of microscope	Area of leaf sq. cm.	Length of aperture of stomata μ	Number of stomata in field of microscope	
C-311: Brie, from Vilmorin, 1904 (1)	62.7	65							66.0
	64.7	60	8.0	—	—	—	—	—	
A-315: Canadian	56.1	56							64.0
	55.7	55	7.8	—	—	—	—	—	
A-317: Australian									60.0
	54.5	61	14.1	53.1	60	—	—	—	
A-321: Huda	63.4	53							69.1
	58.9	62	8.5	—	—	—	—	—	
A-324: Probsteler	54.4	65		60.0	49				56.1
	52.6	70	11.5	59.6	49	15.7			
B-326: Swedish	53.5	64							64.8
	54.5	64	11.7	—	—	—	—	—	
A-351: Duppaue, from Breslau Exp. Field, 1901	52.4	71							65.0
	51.8	70	10.6	—	—	—	—	—	
A-359: Lentewitzer, from Breslau Exp. Field, 1901	55.6	65							65.3
	53.9	64	10.5	56.5	56	—	—	—	
A-368: Heine's Ertragreichster, from Breslau Exp. Field, 1902	55.5	62							66.1
	53.5	67	11.8	57.0	51	19.4			
A-393: Danish, from Exp. Sta. at Hoinow (Polotsk) 1902	54.5	61							—
	53.5	66	11.8	—	—	—	—	—	
A-396: Heine's Ertragreichster, from Exp. Sta. at Hoinow (Polotsk), 1902	56.1	57							—
	54.9	63	11.6	57.3	53	—	—	—	
B-4000: Duppaue, from Exp. Sta. at Hoinow (Polotsk), 1902	50.3	66							60.3
	53.6	61	9.7	—	—	—	—	—	
A-4020: Newmarket, from Exp. Farm of Wissokollitovskoy (Grodno), 1903	56.4	60		59.8	50				61.0
	55.3	64	9.8	58.0	50	15.1			
A-4035: Ljgovo, from Ljivland, 1903	54.9	67		58.0	50				—
	54.8	66	9.8	57.7	54	18.2			
A-4051: Swedish selected	56.9	59							—
	55.5	61	9.5	—	—	—	—	—	
A-4071: from Kirsch (Germany), 1906	55.2	53							61.1
	54.7	55	12.2	58.5	47	17.9			
A-4113: Mesdago from Haagen Schun- idt, 1908	64.1	57	12.4	62.0	50				73.5
	—	—		65.0	50	—			

(1) Two sets of figures for one variety refer to two different plots.

is of Oats (1911 and 1912).

period	Thinning		Total yield (grain and straw) per plant			Yield of grain per plant			1000 grain weight	Attack of rust (<i>Puccinia coroniformis</i> Kleb.)
	Average	1911	1911	Average 1911	1912	1911	Average 1911	1912		
			gr.			gr.			gr.	
120	2.8	2.9	6.8	8.2	6.6	2.7	3.0	1.9	28.0	moderate
	3.0		9.7		8.4	3.4		2.6		
	1.6		6.4			2.8				
107	1.5	1.6	5.8	6.1	7.3	2.8	2.8	3.4	38.5	severe
	1.9		5.8			2.8				
100	2.1	2.0	6.6	6.2	5.8	3.2	3.0	2.1	35.4	"
	3.4		7.5			3.0				
121	3.1	3.3	7.2	7.4	—	2.8	2.9	—	26.6	moderate
	2.3		7.4		9.7	3.8		3.0		
108	2.0	2.2	6.0	6.7	9.2	2.9	3.4	3.2	35.9	severe
	2.0		5.4			2.5				
107	1.7	1.9	6.6	6.0	5.4	3.1	2.8	2.2	37.8	"
	1.9		7.5			3.6				
107	1.8	1.9	6.5	7.0	5.9	2.7	3.2	2.5	33.5	"
	1.9		7.9			3.4				
108	1.6	1.8	6.5	7.2	6.9	2.9	3.2	2.6	37.2	"
	1.5		7.2			3.2		2.6		
108	2.0	1.8	7.9	7.6	7.8	3.6	3.4	3.0	33.8	"
	1.7		5.8			2.3				
110	2.1	1.9	4.2	5.0	3.8	1.7	2.0	1.7	36.0	"
	1.4		7.0			3.1				
107	1.4	1.4	6.0	6.5	—	3.0	3.1	—	33.9	"
	1.6		6.0			2.9				
108	1.8	1.7	6.6	6.3	3.8	3.2	3.1	1.7	37.2	"
	1.9		5.6			2.6		2.8		
108	1.9	1.9	6.7	6.2	8.5	3.1	2.9	3.0	40.3	"
	1.9		5.5			2.8				
109	2.0	2.0	6.9	6.2	5.2	3.0	2.9	2.1	38.5	"
	2.2		7.3			3.0				
111	2.6	2.4	7.8	7.6	3.1	3.6	3.3	1.5	40.2	"
	2.0		7.0			2.9				
113	2.0	2.0	7.8	7.7	4.6	3.4	3.2	1.7	39.7	"
	2.6		6.7		5.6	2.9		1.8		
96	2.4	2.5	6.2	6.5	5.2	2.8	2.9	1.6	30.8	"

According to the investigations of W. Zalensky and W. Kolkunov as well as to the present observations on oats, there is a certain correlation between the size of the guard-cells and that of the aperture. As regards the number of the stomata, this is, according to Prof. Kolkunov, "a function of the length of the stomata," but this parallelism did not come out in the investigations of the writers on oats here described. Thus, the large-celled lines C-311 and C-321 in 1911 has a relatively large number of stomata (38 and 40 in leaves of the third node from below), while A-4113 the same year had a smaller number (31) in the corresponding new leaves. Further, there is no rule in the case of the second group of lines (those with small stomata).

The oats investigated show no correlation between the linear size of the stomata and the leaf area. Thus the large-celled C-311 and C-321 have the narrowest leaves, while the equally large-celled A-4113 has quite large leaves, well-developed as regards length and width. On the other hand, the Australian oat, A-317, a typical representative of the second small-celled group, shows a luxuriant leaf development. Thus the largest leaf area.

With regard to the anatomical characteristics of the oats, it was found that the results confirmed W. Zalensky's law respecting the division of stomata according to number and length in the different rows, viz. "the higher the insertion of the leaf, or the further the latter is situated from the root system, the more stomata it has on the same area in comparison to those of a leaf which is placed lower down; but on the other hand, the size of the stomata diminishes with the distance from the root-system."

As in wheat, so in oats, the number of stomata on the upper surface of the leaf is larger than that on the lower; this is contrary to the general opinion on the subject. In distinction to what Prof. Kolkunov found in wheat, the stomata on the lower surfaces of the oats examined by the writers were invariably the larger.

As to the regularity with which the stomata are distributed on the leaf surface, it has also been observed that the number of openings increases in the direction of the tip of the leaf, but their length decreases.

The observations of Prof. Kolkunov, who succeeded in establishing a number of correlations between the anatomical and physiological characters of some varieties of maize and wheat, were not confirmed by the writers' experiments on varieties of oats. For these investigations the writers selected those properties, which are most important for summer cereals in a fairly damp climate with a moderate summer temperature, i. e. the length of the vegetative period, the degree of rust resistance, etc.

From these observations, there appears to be no connection between the length of the stomata and the length of the vegetative period. Thus, the oats of the Dago, which generally ripens early, and Brie and Hudan, which are late, have stomata of the same size.

In the same manner, no regular correlation exists between the size of the cells and the amount of tillering. Three large-celled lines, C-321 and A-4113 tiller freely (3.3, 2.9, 2.5) but A-4051, a small-celled line, tillers sparingly (1.5, 1.2, 1.1).

niety, resembles them in this respect (2.4); whilst A—396, which st (r.4), does not possess cells of the smallest size. ssen and Marshall Ward only arrived at negative results respect- connection between size of stomata and susceptibility to rust, g to the investigations of the writers, Lines C—311 and A—321, ve the biggest stomata which are also fairly numerous, are least le to rust (*Puccinia coronifera* Kleb); this agrees with the results all Ward's researches, that "Susceptibility to or immunity from tuck does not depend upon the anatomical structure of the leaf, one or more internal factors."

lly, as might *a priori* have been expected, yield, as a function of ctors, does not depend upon a single cause, and is therefore not ependent upon the size and number of the stomata.

e negative results are neither improbable nor unexpected. For, h the structure of plant organs tells us very little concerning their ;" as Johansen writes in his *Elementen der exakten Erblchkeits-*. The same structure in organisms permits of differences of function it is clear that similarity of function cannot be uniformly assumed ilarity of form" (Pfeffers' *Pflanzenphysiologie*, p. 291).

present subject leads also to the question of the correlation be- rious physiological functions and anatomical structure, and the y of determining the former from the study of the latter. "All hods are based on the principle of correlative variability and have ; been of good service in facilitating quick classification, and easy , but they have also led to grave error of judgment." Johansen, chapter XVIII.

doctrine of correlation has itself undergone great changes in the f the last few years; these are especially due to the influence elism, which insists upon the independence and integrity of rs.

ould also be mentioned that in addition to these 17 varieties of others were investigated, but are not described here. The results researches are on the whole in agreement with those described

Wheat Investigations in India.

and, A. — *Report of the Agricultural Research Institute and College, Pusa, for 1911-12*, 1913. Calcutta, 1913.

of the first results of the wheat investigations at Pusa was the ration that varieties of high milling quality could be grown in nd, by selection and hybridisation, these qualities have been suc- combined with high yielding power, rust resistance, and strong elds of over 40 bushels per acre being obtained without irrigation re. During the years 1910-12, the trials of these new varieties ended to other wheat-growing areas in India with the most excel- lts. The new varieties were tested in the United Provinces, in ab, in the Central Provinces, and in various other parts of Bihar

both with and without irrigation. In all cases the yields obtained well above the average for each district, and the grain was of high quality. A further proof of the success of these new varieties lies in the great demand for seed which has arisen during the past few years, and which now could only be met in part. However, arrangements have been made with three estates to grow a large stock of seed for distribution, which should be sufficient to satisfy all demands, whilst at Pusa the various varieties will be maintained in pure culture for purposes of restocking.

A certain number of cultivation experiments are also being carried out at Pusa. The first, which concerns the continuous growth of a crop without manure, shows that after five years' cropping the natural fertility of the soil is unaffected. The next deals with the treatment of the ground previous to the sowing of wheat, and compares the effect of cultivating the ground during the hot weather with the more usual practice of delaying the first ploughing till after the commencement of the rains. The former system considerably increases the yields and the effect appears to be cumulative. Lastly it has been demonstrated that waterlogging of land in September reduced the subsequent crop by 50 %, and this was shown to be due to the lack of available nitrogen, caused, not due to a change in the soil flora.

A considerable amount of breeding work was done during the 1911-12 at Pusa, particularly with regard to the production of new resistant varieties with high yielding powers and strong straw. Interesting facts with regard to the inheritance of characters have been elucidated and a paper on this subject has been published. (1)

358 - A Good Tuber Plant: *Arracacia xanthorrhiza*.

NOUGUIR. A "mandioquinha" ou "batata salsa". — *Chacaras e Quintais*, [Vol. VII] pp. 8-9 + 3 figs. São Paulo, Brazil, January 15, 1913.

Arracacia xanthorrhiza Bauer (old synonym *Arracacha esculenta*) an umbelliferous plant, is indigenous to the Bolivian Andes (2), and is also cultivated under the name of "sacharachaca." It is not very spread; it is cultivated to a certain extent in Brazil, and deserves to be grown on a greater scale, as it produces a nutritious tuber; it resists frost, is not exacting, and yields abundantly. It thrives in all kinds of soils excepting pure clay and it allows of the utilization of poor soils which are not used for other crops. After ploughing the soil lightly, the seeds of the parent plant are set at about 30 inches each way from each other. Every plant produces 10 to 15 tubers; harvesting the crop commences in the second year and continues throughout the year. Interculture is possible in one hoeing.

(1) See No. 118, B. Feb. 1913.

(2) According to the *Index Kewensis* Tomus I, p. 193, Oxoniis, 1895, *A. xanthorrhiza* is a native of Jamaica.

New Species of Clover.

IES, A. (Director of the Royal Seed-testing Station, Budapest) in *Mark Lane*, Vol. 109, No. 4246, pp. 183 and 185, London, February 10, 1913.

In autumn of 1910, the author was twice asked to report on seed which consisted of a mixture of *Trifolium parviflorum* and *T. and* and this year he estimates that there are 80 tons of this seed market. The two plants are almost always found growing together on very alkaline clay soils of the Hungarian lowlands, where they are chief constituents of valuable pasture and meadow. They are usual clovers, and in wet years or in wet spots produce an abundance; under drier conditions the plants remain dwarf and therefore a short crop, but always of good quality. They are both very nutritious, and after the middle of June, if the season be dry, become valuable; the production of large numbers of seeds, which are abundant, facilitates the process of self-seeding.

Under similar conditions of soil and climate prevail, these species probably give equally good results, but all experiments so far show that under other circumstances the plants are of no value.

The seeds are finely reticulated, especially those of *T. parviflorum*, otherwise resemble those of Dutch clover (*T. repens*), while the *T. angulatum* are more similar to those of alsike (*T. hybridum*).

Cotton Industry in the West Indies.

INDS, W. N. The Results of the Cultivation of Cotton in St. Vincent.

COMPANY, H. A. The Cotton Industry in the Leeward Islands.

OVELL, J. R. The Cotton Industry in Barbados.

ORSON, W. Cotton Selection in Montserrat.

ORSON, W. The Manner of Cross-Pollination of Cotton in Montserrat.

ORSON, W. Sakellarides Cotton in Montserrat.

1st Indian Bulletin, Vol. XIII, No. 1, pp. 1-28. Barbados, 1912.

I. — Cultivation of Cotton in St. Vincent

Exports of cotton:

From April 1st, 1910, to March 31st, 1911	lbs.	540 339	£ 41 836
1910-11	»	2 392 884	£ 160 407

Area planted (1911):

Land cotton 3587 acres; Marie Galante 1093 acres; Total 4680 acres.

Estimated value of the 1910-1911 crops, based on the actual yield and prices:

561 326 lbs. Sea Island Cotton at 18 s per lb.	42 114
752 tons » » cotton seed at £ 5 per ton	3 760
26 748 lbs. Marie Galante cotton at 9 s per lb.	1 003
35 tons » » cotton seed at £ 5 per ton	175

Total estimated value . . . 47 052

Usage of lint to seed cotton: 24 (Marie Galante, white) to 26.5 (Sea Island, Marie Galante, stained).

Cotton growing is now the chief industry of St. Vincent. Government Central Cotton Ginnery, managed by the Agricultural Department, is the largest in the Colony and deals with more than half cotton output. Under an Ordinance of 1909 all lots of seed cotton than 100 lbs. in weight have to be sold to the Government Central Ginnery. The largest quantity, however, which can be purchased from an grower without the permission of the Administrator is 4 000 lbs. Central Ginnery anticipates one-quarter of the estimated value lint per lb., less 5 c. for ginning and shipping charges and export. At the end of the crop, a bonus equal to three-quarters of the net is distributed. This system of sale has encouraged cotton-growing the peasantry. In 1911, 542 small planters grew Sea Island cotton 916 acres. Selected and disinfected cotton seed is furnished to at a low price by the Department of Agriculture.

Under the provisions of the Cotton Disease Prevention Ordinance of 1910 all growers are required to destroy by fire all cotton bushes previous cotton season on or before April 30 in St. Vincent and before March 31 in the Northern Grenadines. The Ordinance does not apply to the Southern Grenadines, where practically only the pink Marie Galante cotton is grown.

Pests and Diseases.—No attack of the cotton worm (*Alabama gillacea*) has been recorded during the past four years; its chief enemy, the Jack Spaniard (*Polistes annularis*) is now protected on all estates. The local cotton stainer (*Disdercus delawarensis*) is always in large numbers towards the end of the crop. It is advised to destroy besides the cotton plants toward the end of the season, other plants which supply food to this insect pest, that is the silk cotton (*Eriodendron tomentosum*, John Bull or Mahoe (*Thespesia populnea*), Tobago breadfruit (*Chrysophyllum*), and Ochro (*Hibiscus esculentus*). Damage was also done by the leaf blister mite (*Eriophyes gossypii*) and black scale (*Aspidiotus setia nigra*). *Bacterium malvacearum* and anthracnose (*Colletotrichum gossypii*) were the most dangerous diseases.

2. — The Cotton Industry in the Leeward Islands.

Acreage planted (1911-1912):			
Antigua 517 acres	St. Kitts 1650 acres	Montserrat 2500 acres	(estimated)
Barbuda 130 "	Nevis 2000 "	Anguilla 800 "	(estimated)
Cotton crop of 1910-11 in Antigua: 96 992 lbs. of lint; average yield 173 lbs. per acre			
Exports of lint (1910-1911):			
St. Kitts 329 322 lbs.	}	Total return of lint per acre 216 lbs.	
Nevis 343 395 "			
Anguilla 148 595 "			
Montserrat 109 000 "		(Up to November 1911).	

In Anguilla, the young crop has suffered very much from the attack of a small beetle which cuts down the young plants. At Montserrat

suffered from the attacks of the cotton stainers (*Dysdercus andreae*) the flower-bud maggot (*Contarinia gossypii*).

3. — *The Cotton Industry in Barbados.*

Acreage under cotton from 1906-7 to 1910-11. 28 824 acres
 Average yield: Cotton lint 4 529 870 lbs. of the value of £ 285 746
 " seed 11 144 421 " " " £ 24 791

The average production per acre, which was 338 lbs. of lint in 1902-when cotton cultivation was begun in Montserrat, has constantly increased and was in 1910-11 153 lbs. In order to counteract this the Department of Agriculture has undertaken work for the improvement of the quality and quantity, either by selection or by crossing of Sea Island cotton with very hardy varieties. The results so far obtained confirm those found by O. F. Cook of the Department of Agriculture of the United States, in that the hybrids proved to be very variable, showed parental characters (those of the parent plants), interparental characters (intermediate), extraparental characters (not within parental groups or between them). The latter could be divided into mixed, intensified and primitive characters.

By the continued selection of a cotton which in 1908 had fibres 36.1 mm. and 35.7 per cent. of weak fibre, and in 1909 yielded 2376 lbs. per acre of unginned cotton, in 1911 a variety, Grant, was obtained with fibres 36.1 mm. in length, 14.4 per cent. of weak fibre and producing 4 406 lbs. of unginned cotton.

In 1909, this cotton was estimated at 11d. per lb. in 1911 at 16 to 17 lb., taking Sea Island cotton at 17 to 19d. per lb. as a base.

4. — *Cotton selection in Montserrat.*

Cotton selection has been carried on uninterruptedly at Montserrat since 1906. The following method of perpetuation of a particular strain has been adopted. The seeds of the plant selected in 1909 are planted in the breeding lot in 1910. In this year six of the plants are marked and the seedlings collected into separate bags, the lint is submitted to spinning tests and the seeds of the two plants showing the most desirable features are selected for planting in 1911. The two plants in 1911 are treated as if they were separate strains, and six plants are again re-selected and the seedlings collected separately, from both types, the lint of the twelve plants is subsequently examined. Thus the inheritance both for breeding qualities (yield) and lint characters comes into perspective, and the type giving the best all-round features is perpetuated.

In the course of these selection experiments it has been shown that the germinating power of seeds can be destroyed by the heating of seed-cotton also when seeds are stored in bulk after ginning. As a rule cotton seeds show a high germinative power as they come from the field, but when cotton is picked, this is not always the case. This suggests the neces-

FIBRE CROPS

lays old and again at one month. The perennial varieties — that Island and Egyptian — were planted from 5ft. to 7ft. apart in The rows of the rest were 4 ft. apart. The annexed table shows s obtained :

Variety planted	Height of Plant		No. of Bolls to Plant		No. of Bolls to 1 lb. of Seed Cotton		Percentage of stand	Size of Plot	Yield per acre
	Selected	Average	Selected	As found	Selected	As found			
	in.	in.						acres	
Sea Island.	102	78	188	150	89	112	99	5	1 369.8
Egyptian Mitaffi. . .	102	78	222	99	98	119	94	3	1 285.6
American Toole . . .	60	51	130	71	66	75	80	2	2 067.5
Nyasaland Upland . .	72	60	168	97	68	73	52	3½	1 548.2
Cleveland Big Boll . .	54	48	59	39	43	52	100	½	1 010.0
Berlong	48	45	57	34	—	—	100	¼	810.0

ea Island and Egyptian varieties grew out almost too luxuriantly, sun was excluded to a great extent and only about half of the ed. The annuals also grew out well and gave very satisfactory

her conditions were favourable during planting time, but a pro-riod of drought set in when plants were about six weeks old. The freely cultivated and a certain amount of hand-hoeing was to keep the field clear of weeds.

ollowing is the cost of production and estimated profit per acre ferent varieties planted :

	£.	s.	d.
Sea Island			
Preparing and ploughing	0	10	0
Harrowing	0	1	0
Planting	0	1	0
Seed	0	1	0
Chopping (thinning out)	0	2	0
Cultivating and hand-hoeing	0	12	0
Picking	1	16	0
Transport	0	4	0
Wear and tear of implements	0	1	0
Sundries	0	2	0
	£	3	10 0

1 369 seed cotton at 3 d. per lb.	17	2	3
Less cost of production	3	10	0
Estimated profit per acre	£ 13	12	3
<i>Milaifi</i>			
1 285 lbs. seed cotton at 3 d. per lb.	16	1	3
Less cost of production	3	0	0
Estimated profit per acre	£ 13	1	3
<i>American Toole</i>			
2 067 lbs. seed cotton at 3 d. per lb.	25	16	2
Less cost of production	3	10	0
Estimated profit per acre	£ 22	6	9
<i>Nyasaland Upland</i>			
1 548 lbs. seed cotton at 3 d. per lb.	19	12	0
Less cost of production	3	0	0
Estimated profit per acre	£ 16	12	0
<i>Cleveland Big Bolt</i>			
1 010 lbs. seed cotton at 3 d. per lb.	12	12	6
Less cost of production	2	15	0
Estimated profit per acre	£ 9	17	6
<i>Herlong</i>			
810 lbs seed cotton at 3 d. per lb.	10	2	6
Less cost of production	2	15	0
Estimated profit per acre	£ 7	7	6

The cost of production per acre varies in the different varieties to additional cost of picking of one variety as compared with another. cost of picking was higher in the case of the Sea Island owing to the not opening well and in the case of the Toole owing to the heavy

The second year crop of the Sea Island variety is of very good and of satisfactory yield.

The only insect pest which troubled the field in question was a stainer (*Dysdercus supersticiosus*) but not to any great extent.

362 - Cotton Experiments in British Guiana.

HARRISON, J. B. and STOCKDALE, F. A. in: *West Indian Bulletin*, Vol. XIII, pp. 40-55. Barbados, 1913.

Experiments in growing different foreign varieties of cotton been in progress for some time (*West Indian Bulletin*, Vol IX, pp. 213). None of the varieties grown however paid for the cost of their cultivation.

t these experiments were discontinued after 1908, and attention was to producing hardy varieties suitable for the heavy clay soils of coastal region.

be writers give tables incorporating the data resulting from the ob- of 103 hybrid Sea Island and Buck plants (indigenous variety) r generations (100 individuals per generation) F_1 ; of 274 F_2 plants; F_3 plants (derived from the seeds of 7 F_1).

While refraining from discussing these data in detail, until those a further generation are available, the writers state that it is now le to select, even in three generations, cottons that seem to be ally true to type. Variety 59.66, an extracted sea Island cotton, vigorously on heavy clay soil and under meteorological conditions the ordinary commercial strains of this cotton refuse to grow. y 59. 33 is also interesting from its short staple cotton and com- ively early maturity.

Yials have also been made in crossing indigenous cottons from the nuni district with Sea Island, and the results seem encouraging.

Action of Light on the Growth of Seed Beets.

ROEMER, F. Einfluss der Belichtung auf das Wachstum der Samenrüben. — *Mitteil- gen der chemisch-technischen Versuchsstation des Zentralvereines für die Rübenzucker- industrie*. Serie IV, No. 41. *Oesterreichisch-Ungarische Zeitschrift für Zuckerindustrie und Landwirtschaft*, Year XLII, Part 6, pp. 913-931. Vienna, 1912.

in a preceding work of Strohmmer, Briem and Fallada (*Oesterreichisch- rische Zeitschrift für Zuckerindustrie und Landwirtschaft*, Year XL, , p. 11) it has been demonstrated that a lack of light during the first of vegetation causes in beets a considerable development of the leaves e expense of the root, and modifies unfavourably the composition of dry matter of the root from an industrial point of view by diminishing gar content. The writers proposed to ascertain if in the second year egetation the lack of light favours the development of the upper part e plant at the expense of the lower and whether it increases the pro- ion of seed or modifies its characters.

The first series of experiments, like the preceding ones, was conducted e Wobanka station for the production of beet seed at Uholiczky near ue. Three one-year-old beets (I, II, III), of equal weight and sugar ent (18.0 per cent.) were halved, one of the halves (a) was planted so as ceive the sunlight for three quarters of the day, the other half (b) was ed under some trees so as to be always in the shade. The results ined in a dry year, 1911, are shown in Table I.

TABLE I.

	I		II		III*
	(a) half	(b) half	(a) half	(b) half	(a) half
Weight of seed grams	98	25	106	28	23
» » stems and leaves »	134	57	132	69	71
» » roots »	85	55	92	58	62
Seed clusters, weight per cent. of those produced by (a) halves	—	25.5	—	26.4	—
Number of clusters in 1 gram	78	94	74	84	90
Size of clusters mm.	3.5-4	3-3.5	3-3.5	3-3.5	3-3.5

* The beet was not perfectly sound.

In the germination tests no essential difference was observed between the seeds produced in the sunlight and those in the shade.

The seeds of this generation were used in cultivation experiments carried out, with the usual tillage and manuring, in 1912 at Grosskendorf, Hungary and at Dürnkrot, Lower Austria. Numerous untailored tables give the meteorological observations, cultural and analytical results. Table II. refers to the sugar content.

TABLE II. — Sugar Content of Beets.

Experiments at Gross-Zirkendorf.

	Offspring of the half kept in the sun				Offspring of the half kept in the shade		
	Number of beets analysed	General average %	Maximum %	Minimum %	Number of beets analysed	General average %	Maximum %
Beet I . . .	58	19.80	21.00	17.60	57	20.13	21.20
Beet II . . .	59	20.04	21.00	19.10	58	19.88	21.35
Beet III . . .	18	19.74	20.90	18.25	18	19.43	21.00

Experiments at Dürnkrot.

Beet I . . .	18	18.43	19.25	16.60	16	18.20	19.20
Beet II . . .	17	18.61	19.40	18.05	18	18.36	19.20

It may thus be affirmed that the sugar content of beets deriving from individual selection is a hereditary and transmissible character.

has been suggested to employ colonists for the cultivation of sugar and to purchase and work up their production in large central factories as far as the writer knows the advice has been followed only on the estate near Tampico, where it has given excellent results. In order to show the advantages of the system the writer quotes the example of Cuba, which is common, and gives the following data referring to the system, taken from official documents and from Cuban sugar factories.

cane:	average (60 000 arrobas per caballeria)	45 235 lbs. per acre
	good (80 000 " " " ")	60 313 " " "
sugar from average crops:		
	average yield 12 per cent.	5 428 " " "
	good yield 12.5 per cent.	5 654 " " "
factory gives the grower on the share system from 40 to 52 % of the sugar and from the cane he delivers, namely:		
average crop, yield of sugar 12 per cent.		
giving the grower 40 per cent. of the sugar	2 388.32 lbs. per acre	
	at \$2.80 per cental	\$66.87 " "
average crop		
giving the grower 48 per cent. of the sugar	2 605.44 lbs. "	
	worth	\$77.95 " "
average crop		
giving the grower 52 per cent. of the sugar	2 822.56 lbs. "	
	worth	\$79.03 " "
good crop		
giving the grower 40 per cent. of the sugar	2 895.00 lbs. "	
	worth	\$83.67 " "

*Cost of production of 1 acre.**Preparation of the soil*

Clearing	\$1.50 to 10.00
First ploughing	4 — " 6 20
Second "	2.70 " 3 —
Harrowing	1 — " 1.25
Preparation of the beds	1.25 " 1.55

Total . . . \$10.45 to 22.10

Sowing

Canes	\$4 — to 5 —
Carriage	0.50 " 0.70
Cutting into pieces	0.50 " 0.80
Planting of pieces	2.50 " 3.50
Covering with earth	3 — " 3.80

Total . . . \$10.50 to 13.80

Interculture

Cost of three hoeings \$10.55 to 12.60

Cutting the canes and carriage to the mill

Cutting and loading	\$12.75 to 18 —
Carting	9 — to 18 —

Total . . . \$21.75 to 36 —

General total . . . \$53.25 to 84.50

Cost of renewing the seed \$15 per acre

*Balance of a plantation lasting six years
and yielding 45 235lbs of canes per acre per annum.*

Sowing, interculture, and cutting the first crop	\$ 60 per
Interculture and cutting each successive crop: \$10 per acre for five crops	200 "

Cost of production of six crops \$260 "

Canes produced per acre: 45 235lbs; sugar 12 per cent.; share of the grower 48 per cent. of the sugar, that is	2 605.44lbs. per ac
at \$2.80 per cental.	\$72.95

and for the six years. . . \$437.70

Difference between outlay and returns for the six years' . . . \$177.70

From this difference the fixed expenses are to be deducted. The
estimated as follows for a farm of 3 caballerias (about 100 acres):

Construction of dwelling	\$300
Nine yoke of oxen	900
Two horses	130
Implements	220
Enclosures	250
Pasture for live stock	60
Carts for transport of cane	140
Total	\$2 000

Share per acre of above expenses	\$20.25
Interest at the rate of 8 per cent. for 6 years and per acre.	9.72
Depreciation 40 per cent	8.10
Total fixed expense per acre after six years	\$17.82
Difference between the value of the sugar delivered to the grower and the cost of production of the cane, for six years	\$177.70 per acre
Fixed expenses for six years	17.82
Profit during six years	\$159.88
Yearly profit.	26.64

above profit refers to average soils and years; under favourable conditions a profit of \$40 to \$45 per acre and upwards may be realized.

The Yield of Hevea in Java.

HEDEMANN, E. La Production de l'Hevea à Java. — *Le Caoutchouc et la Guttapercha*, 10, No. 108, p. 6 995. Paris, February 15, 1913.

MOU, A. H. L'Hevea à Java. — *Bulletin de l'Association des planteurs de caoutchouc*, Vol. V. No. 2, pp. 38-39. Antwerp, February 1913.

P. Arens has published a study on the yield of some Hevea plantations. The experiments dealt with the trees of six plantations and the tapping varied from 1.05 to 2.94 grams. In the year one can upon 180 days in which tapping is done, which gives a yield per tree per year of 348 to 648 grams. A first conclusion can thus be drawn from Java, trees from 5 to 7 years old can produce an average of 500 grams (lb.) of rubber per year. Another point to which the writer draws attention is the lower yield of plantations in which the trees are crowded. This is also from observations made in Java that daily tappings are more productive than those made every other day. Dr. Berkhout, former director of forests in Java, observes on the other hand that the yield is not inferior to that obtained in the Malay peninsula.

Among many other plantations situated in the Island of Java, the writer mentions only those in the Preanger Regency. In the plantation of the Abang company, during the first year of tapping, the tappings commenced in January on 22 800 trees were extended to 42 835 trees in December, a total production of 26 730 lbs. In the plantation of the Tjondog company 21 000 trees yielded 2 628 lbs. per month and an average of 750 lbs. (1 lb. 10 oz.) per tree tapped was expected for the first year. In the plantations of the Franco-Dutch Colonial Planting Company the first trees were tapped at the age of only 4 years. In 1911, 104 890 trees were yielding 171 310 lbs. The yield according to age was as follows:

RUBBER
GUM AND
PLANTS

	Grams per tree
Trees planted in 1904	1 270
" " 1905	826
" " 1906	683

These figures, higher than those quoted by M. Arens, seem to M.hout to leave no doubt as to the normal yield of thriving trees in a managed plantation.

366 - **On the Existence in West Africa of Two Stable Forms of *Hevea brasiliensis* with Different Rubber Yields.**

BRET, C. M. Sur l'existence, en Afrique Occidentale de deux formes stables, *brasiliensis* à rendement différent. — *Comptes Rendus de l'Académie des Sciences*, Vol. 156, No. 6, pp. 478-479. Paris, February 10, 1913.

Hevea brasiliensis, which is almost exclusively cultivated in rubber plantations of the Far East, has hitherto given rise to very variations from the usual type. The writer, during the time when he lived on the West Coast of Africa, had occasion to observe two plantations; the trees were not of the same origin and their latex appeared to be different.

One of the two varieties, which formed a stand of 70 trees at Abidjan (Ivory Coast), was more vigorous in appearance than the other, which its anatomical characters distinguished it very clearly. The one of which there was a stand of 6 trees at Porto-Novo (Dahomey) yielded a larger amount of rubber.

The characteristic anatomical difference consists especially in the fact that in the high-yielding form the swollen basis of the petiole contains a number of laticiferous tubes in the cortical parenchyma, especially on the ventral surface, and in the liber, while in the more vigorous form the laticiferous tubes are much less numerous.

These two forms of *Hevea* have a different origin; the trees at Abidjan stand were grown directly from seed collected on the Amazon, while the Porto Novo trees came from the Ebute Meta (Lagos), having been sent out from the Royal Botanic Gardens at Kew.

The writer's experiments show that the offspring of these two forms retain the characteristic differences in vigour and yield, even under different conditions from those prevailing where they were first observed.

The easy method which allows these forms to be recognized by the observation of the anatomical structure of the base of the petiole is recommended, as it might be used to effect a rapid selection.

367 - **Manihot and Hevea.**

Manihot et Hevea. — *Journal d'Agriculture Tropicale*, Year 13, No. 133, Paris, January 31, 1913.

In an article signed F. V. (1) the question of the advisability of

(1) See *Journal d'Agriculture Tropicale*, No. 132, June 1912.

ting *Manihot* and *Hevea* side by side was raised and answered
tively. Further, as M. Girard, who has practised this mixed cul-
s in Cochín-China since 1910, using *M. dichotoma* and *pianhyensis*,
for information respecting the best methods of tapping, for only
us of applying tapping methods entirely satisfactory to himself,
he be able to give, in his turn, interesting information on the
cultivation of *Manihot* and *Hevea* in Cochín-China and on the
of his experiments in incising *Manihot* trees. It was thus useful
to the information which M. F. V. was able to furnish on this
the data collected by M. V. Cayla in the course of a visit to
azilian plantations of various species of *Manihot*.

he following method is advocated by M. F. V. as the result of his
al experience on the Congo.

The thick bark of the trees should be removed in order to obtain
oth clean surface.

The tree should be divided into 4 sectors and the incisions made
form of half a fish-bone to a height of 6 ft 6 in. from the foot of
ee and 6 in. apart.

One sector must be incised per day and the next day the scrap
be removed, the incisions being sprayed with Bordeaux mixture.
m as the cuts have cicatrised, the process is repeated, the new in-
s being made below the former ones.

The best time for tapping is before 8 a. m., but it can be continued
the day in the case of trunks in the shade.

An ordinary implement is used, care being especially taken to
injuring the cambium.

No tree should be tapped till it is 4 years old.

The latex should be allowed to coagulate without being disturbed,
preferably in the form of "crêpe".

I. V. Cayla states that in Brazil in the State of Rio Janeiro, it
essary to remove the thick bark from *Ceara* trees (*Manihot Gla-*
) of from 7 to 8 years of age, or more, in order to make clean-cut
one incisions. In the case of the other species of *Manihot*, a rapid
light scraping with the cutting knife is all that is requisite.

M. Glaziovii is tapped with a "machadinho" (1) according to the
od of the "seringueiros", but *M. pianhyensis* ("pianhy") and
ichotoma ("jêquê") are treated in a still rougher manner; while
latex from *M. Glaziovii* is collected in receptacles ("tigelinhas") sus-
ded from the trees below the incisions, that from *M. dichotoma* flows
a vessel at the foot of the tree, while the latex exuding from
pianhyensis flows into a hole dug in the ground.

The fish-bone incision is not practised in Brazil, where it would not
onomical in the case of *Ceara* on account of the peculiar nature of
ark of this tree.

1) A small axe used by the "manisobeiro". Cfr. *Le Mantsoba* by A. Moulay. Paris,
Imel, 1906. (Ed.).

But the diameter and height of the *Manihot* trees depend on cultural methods, which seem to be completely ignored in the State of Bahia where the want of care taken does not permit of stating with accuracy the height to which incisions can be made. The trees are tapped as high as possible; small incisions can be made in nearly half the circumference of the trunk of *M. dichotoma* without causing any injury to the tree.

As for the age, it is better not to begin tapping too early. Nevertheless, *M. pianhyensis* is often tapped when 2 years, or even 18 months old and the dead tree is replaced by a fresh productive tree grown in 18 months by filling up the gaps with slips.

The rubber from the Brazilian species of *Manihot* coagulates of its own accord; its quality is good and it fetches a high price. It is, however, deficient in purity, but this might be remedied by filtering the latex before coagulation, pressing and drying the coagulum with care.

368 - Technological Study of the Congo Varieties of Rubber.

Étude technologique de Caoutchoucs du Congo. — *Ministère des Colonies, Bulletin de l'Office Colonial*, Year 6, No. 62, p. 63. Melun, February 1913.

1. Rubber from Oubangi: *Funtumia elastica*. — Being little vulcanized this is less tenacious, less resilient, less elastic, more supple and more tensible than "fine Para hard cure". But when more vulcanized it is equivalent to it. It is a rubber quite comparable with the best Para kinds.

2. Rubber from the Upper Chari: *Landolphia ovariensis*. — Extracted by pounding the rhizomes of dwarf varieties of *L. ovariensis*. This liana rubber of average quality.

369 - Study of *Coffea robusta* (1).

DE WILDEMAN, E. Étude sur le *Coffea robusta*. — *Bulletin de l'Association des Plantiers de Caoutchouc*, Vol. IV, Nos. 3, 4, 12, and Vol. V, No. 2, pp. 54-56, 78-79, 117-118, and pp. 28-31. Antwerp, March, April, December 1912 and February 1913.

For some years past, the question of *Coffea robusta* and of its commercial value has been dealt with in all Colonial Agricultural Journals. In this article, the writer has collected all the data, which seem favorable to a large extension of the cultivation of this plant. Already in 1909, he maintained, in a paper contributed to the *Annales du Jardin Botanique de Buitenzorg* (2), and containing an exhaustive bibliography of the cultivated varieties of *Coffea*, that *C. robusta* is not a species, a variety or form of *Coffea canephora*, indigenous in Central and West Africa.

(1) This plant, which has been collected by M. Ed. Laja in the Belgian Congo and M. Chevalier in the French Congo, is known in some recent treatises under the name *C. robusta* Chevalier. It is not mentioned in the *Index Kewensis* and supplements issued up to 1908. The seeds for the plantations in the Dutch East Indies came from Benin (E.B.).

(2) *Matériaux pour une étude botanico-agronomique du genre Coffea* (Caféiers cultivés). *Annales*, Series 2, Suppl. III. Java. (Author's note)

robusta, when carefully cultivated, forms a shrub with horizontal, incumbent branches, which at the flowering and fruiting seasons, bend beneath the weight of the flowers and fruit. This production is one of the characteristics of the variety from the economic point; for no other kinds of cultivated coffee plants bear so many

Another important characteristic which must be dwelt on is its maturity; it is in full bearing long before *C. liberica* and *C. arabica* and before *Hemileia* has developed sufficiently to hinder its fructification to any noticeable extent.

But the success of *C. robusta* is especially due to the fact that it grows between Heveas and to the economic results obtained by using a grafting stock (3).

YIELDS OF YIELD. The yield of this plant is one of the most remarkable; the following table published by the *Jaarboek* of the Department of Agriculture of Java, gives the crop from different coffee plants of the same age and grown under identical conditions:

Weight of seeds per plant	
Java coffee.	53 to 97 grams
Maragotype	14 to 18 "
Moka (small berries) . . .	27 to 38 "
Moka (large berries) . . .	118 "
Robusta	992 "
Quillou	1020 "
Maragotype on Quillou . .	26 "
" " Robusta	156 "
Eugenifolia.	20 to 133 "
Lanceifolia	10 "
Erecta	43 "
Cochleata	12 "
Rotundifolia	40 "
Laurina	83 "
Unisperma	20 "
Columnaris	17 "
Angustifolia	60 "

be two African varieties, *Quillou* and *Robusta*, are the ones which give the highest yields, while *Maragotype* grafted on *Quillou* produces 1020 gms of seed per tree and on *Robusta* 156 gms per tree, which is far more than any produced by the cultivated varieties formerly known in Java.

SELECTION. An interesting question has been raised of late as to the economic and commercial value of the coffee from the different varieties of these plants; this leads to a consideration of the necessity of improving the cultivated species and varieties by means of selection.

³ This association of crops occurs in Sumatra and Java; *C. robusta* has also been successfully employed as an intercalary crop in coconut plantations. See No. 40, p. 1913. (Ed.).

This is the more important, contrary to what has been affirmed respecting other species of *Coffea*, and especially by Dr. von Faber regards *C. liberica*, seeing that self-fertilization never takes place in the group of *Coffea canephora* to which *C. robusta* belongs; cross-fertilization is the invariable rule. This being the case, it is necessary to protect the plant from bad qualities being introduced by strange pollen. Very careful selection is therefore necessary to ensure good results, and, according to Dr. P. S. Cramer, attention must be directed to the following points:

1. Growth, resistance to fungoid leaf diseases, ramification.
2. Annual production, early ripening of crop, distribution of flowering periods throughout the year.
3. Crops, proportion between good and aborted seeds, thickness of the testa of the fruit.
4. Shape, colour, size of berries.

All selection work, however, presupposes a knowledge of the qualities to be adopted and the value of their produce; unfortunately much confusion still prevails in these matters, as is shown by the different opinions summarized by the writer as to the determination and classification of the various kinds of coffee cultivated.

Mr. Wurth, of the Special Coffee Station at Java, divides the cultivated varieties of coffee plants into 3 groups of which the types *C. arabica*, *C. liberica* and *C. robusta*:

Arabica: *congensis*, *stenophylla*.

Liberica: *abscuta*, *excelsa*.

Robusta: *canephora*, *Quillou*, *Uganda*.

Mr. Wildeman, on the contrary, considers *robusta* as a variety of *canephora*, and *Quillou* as identical with *C. canephora* var. *Sankarum* which together with *robusta* and *Laurentii* are a sort of *canephora* imported with the latter varieties from the Congo. At all events, if *C. arabica* seems to be very variable, this is equally the case with *C. canephora*, and it is impossible yet to be sure whether the *Quillou* variety grown in Java is actually the *Kouilouensis* (Pierre), variety of *canephora*, or another African variety of the same species, or even a local form derived from a plant introduced into Java. All these questions, which are of great scientific and practical importance, still remain to be solved.

CULTURAL EXPERIMENTS. In Java, the answer to these problems is being sought by means of comparative experiments of great interest. The results of Dr. Cramer's study of the proportion of fruit to the berries ready for sale are all in favour of the *canephora* group, and therefore of *Coffea robusta*, seeing that 4 or 5 lbs. of its fresh fruit furnish 1 lb. of berries, while in the case of *liberica* and *Coffea arabica* 15 lbs. and 5 to 6 lbs. respectively are necessary to supply the same weight of coffee berries ready for the market.

Other experiments undertaken for the purpose of ascertaining whether *Quillou* variety was suitable for planting on the sandy soils of Kloet va showed that:

1. In the majority of cases *Quillou* thrives as well as *robusta* in Kloet nurseries and it is only very rarely more backward in growth than the latter.
2. Shortly after being planted out, both varieties develop equally.
3. Until its second year, the *Quillou* variety grows a little less than *robusta* on the Kloet soil, but after this period it makes up lost time and becomes as vigorous as the latter. Their value lies in the uniformity of the type.
4. Under the present conditions, the yield of *C. Quillou* on the Kloet is less than that of *C. robusta* when grown in the same instances.
5. In the district in question, *C. Quillou* is of less cultural value as a general point of view than *C. robusta*.

Other cultural experiments have, however, not given the same results. When the *Uganda*, *Robusta* and *Quillou* varieties are planted so as to compare them with each other and using *Leucoena glauca* as a shade tree, if they are cut at a height of 5 feet and placed 10 ft. X 10 ft. apart, they give the following amount of coffee ready for the market.

Uganda . . .	10.44 piculs per bouw or about	800 lbs. per acre
Robusta . . .	16.60 " " "	1250 " " "
Quillou . . .	21.21 " " "	1600 " " "

CULTURAL METHODS AND SHADE PLANTS. — It is necessary to choose, as a means of preliminary experiments, the variety of coffee to be cultivated; this however, is not all, for the cultural methods most suitable to a given variety must be selected and the variety of shade plant to be employed. The experiments of M. Boon in the experimental plantations of the Dutch East Indian Government at Bangalan, Java, show that the yield of the same variety varies with the shade plant employed. Ratio of yields of cultivated coffee plants grown under the following shade plants:

<i>Solanum grandiflorum</i>	1.59
<i>Adenanthera pavonina</i>	1.82
<i>Cassia alpinia arborea</i>	2.17
<i>Acacia tomentosa</i>	2.43
<i>Hevea brasiliensis</i>	2.77
<i>Albizia moluccana</i>	2.82
<i>Pithecolobium saman</i>	3.06
<i>Grevillea robusta</i>	3.49
<i>Erythrina lithosperma</i>	4.10
<i>Leucoena glauca</i>	4.75

EXTENSION AND PROGRESS OF THE CULTIVATION OF *C. ROBUSTA*
 In order to obtain an idea of the popularity enjoyed in Java coffee plants belonging to the *canephora* group, it is only necessary consult statistics on the subject and especially those compiled by Agricultural Syndicate of the Dutch East Indies. According to the 24 521 000 plants of *C. robusta* have been planted in the 4 years from to 1911. The statistics of yield and of plantation communicated meeting held at Malang in May 1912, gave the following figure plantations:

	1911 Crop	1912 Estimate	Plantings 1911-12
<i>C. robusta</i> and species of the same group	54 685 cwt.	94 312 cwt.	4 686 34
Java	42 873 "	74 460 "	—
<i>C. liberica</i>	15 616 "	9 164 "	22 19
Hybrid	1 763 "	3 445 "	80 17

These few figures, although incomplete, seem to justify the expression by Prof. Treub, late Director of the Buitenzorg Botanic Garden, that soon 60 000 tons of Javanese coffee of Congo origin may be offered on the market. They also show very clearly the progress made in the cultivation of the *canephora* species. The same is affirmed to the case in Madagascar, where the *canephora* variety is preferred to the *liberica* on account of its early and abundant crops, of which the commercial value exceeds by 8s. or 12s. per cwt. that of the *liberica* coffee from the same district.

Nevertheless, the cultivation and exploitation of the coffee plantations in Africa have made but little progress in comparison with the extension of the cultivation of coffee from the centre of Africa, which has taken place in India and the Far East. It should, however, be added that coffee is increasingly grown in some of the German colonies in Africa.

The area under coffee in 1909 was estimated at 1 976 acres in the German colony of Kamerun, and the amount of coffee which could be obtained in this colony reckoned at 2.2 lbs. per tree, 400 trees being planted per acre.

DISEASES AND ENEMIES. — Dr. H. Morstatt, of the Amani Botanical Station has published a long list of the fungoid and insect pests which attack the coffee plants of this colony (1).

(1) Dr. H. Morstatt. Die Schädlinge und Krankheiten des Kaffeebaumes in Ostafrika. Beilage zum Pflanzers, Amani, July 1912.

(Author's note)

Emileia is now found in all the tropical regions of the globe and *C. robusta* is more resistant than the other species, it seems not completely immune from this parasite. In 1903-04, M. E. Lauwrought back from the Congo numerous specimens of the *canephora robusta* groups of which the branches and leaves were attacked by parasite. Other diseases of *C. robusta* have been recorded. Stem canker, due probably to a fungus, *Ascospora Coffeae*, seems to have been able to develop because the plantations were at first very young but its extension has been hindered by planting the shrubs further apart and by burning all infected individuals.

Ascospora coffeicola and *Xyleborus*, the Boeckoff of the Indians, do more damage on the *robusta* than on the *Java* and *liberica* groups; but *Ascospora javanicum*, the Djamoer-oepas of the Indians (produced by *Ascospora viride*), and eel-worms seldom or never attack *robusta*.

All these considerations show how important it is not to send seeds from Africa to new plantations without having taken all the precautions necessary to the interests of the planters.

COMMERCIAL VALUE OF THE PRODUCT. — It is objected that the berries of the *robusta* group and of other African coffees are small in size and of inferior flavour; but the continually increasing quantities of these are sold in Holland and the satisfactory prices they fetch show that the public is beginning to appreciate them. No objections will be made to the size of the berries, when by means of careful cultivation and specially of right preparation, a coffee is obtained equal in flavour to (old) Java and Arabian coffees.

Cacao in the French Colonies.

ROUSSEAU, EM. Le Cacao dans les Colonies françaises. — *Annales de la Science Coloniale*, Year 39, No. 1, pp. 13-19. Paris, January 1913.

The amount of cacao imported into France has progressed regularly from 2000 tons in 1850 to 27 000 tons, representing a sum of £1850000 in 1911.

Of this, the amount of re-exported cacao was double that consumed. Cacao imported into France during the last few years comes principally from Venezuela, Brazil, Ecuador, St. Domingo, the Gold Coast, Liberia, San Thomé, Trinidad and Haiti. The re-exported cacao was chiefly to Germany, Switzerland, England and Belgium. In 1911, 952 lbs. of cacao was imported into France from the French Colonies (after 1 per cent. of duty remitted); this was divided as follows:

Guadeloupe	2 332 733 lbs.	Madagascar	45 797 lbs
Martinique	1 336 237 "	Ivory Coast	33 174 "
Congo	237 833 "	Guiana	27 652 "
New Hebrides	88 000 "	Réunion	2 471 "
Mayotte and the Comoro Islands	56 056 "		

¹ In addition to this, 135 tons (1911) of ground cacao from Germany, Holland and Belgium have been imported. (Author's note).

At Guadeloupe all the cacao plantations are to be found at "Terre", where the area which can be used for this purpose is not estimated at more than 6000 or 7500 acres.

At Martinique the cacao was introduced in 1661 by means of seed from Venezuela. The area suitable for cacao cultivation is estimated here at above 7400 acres.

The first serious attempts at growing cacao in the French Colonies date from 1887 (the creation of the Libreville Experimental Garden); the first plantations were made in 1889. The latter have developed particularly on the coast zone and especially at Gabon in the district of Libreville.

At Mayotte and its dependencies this cultivation is of recent origin.

The only part of Madagascar where cacao trees have any chance of development is the coast district, approximately from Vohémar in the north and Mahanoro or Mananjary in the south. At the present time the Madagascar cacao comes in the first place from the Tamatave district and secondly from the districts of Andevoranto, Vatamandry and Mahanoro. The first exportations were in 1896.

On the Ivory Coast, attention is beginning to be paid to the cultivation of the cacao tree. The first export of the products took place in 1900; and the excellent quality of this cacao was proved by industrial tests made in 1912 under the supervision of the Colonial Garden (Boulevard du Jardin Colonial, No. 108, March 1912).

Although the cacao tree has been found growing wild in certain parts of Guiana, where the climate as well as the soil are very suitable to its requirements, this tree has never been grown in the colony to any extent. It appears that this is due for the most part to the scarcity and cost of labour.

Cacao production might be a source of revenue to Cochinchina, Cambodia and South Annam, but so far the tree has only been grown experimentally in these countries.

371 - New Species of Shade Trees for Cacao, Vanilla and Coffee Plantations

CHEVALIER, A. Nouveaux Arbres d'Ombre pour les Cacaoyers, la Vanille et les Cafés. — *Journal d'Agriculture Tropicale*, Year 13, No. 139, pp. 27-29. Paris, January 31, 1913.

The writer mentions *Rauwolfia vomitoria* Afz., which the colonists of Gabon use to shade their cacao plantations and which he saw employed for the same purpose in the vanilla plantations in the neighbourhood of Libreville.

Rauwolfia is a small tree with a straight trunk and belongs to the Apocynaceae; it is from 16 to 26 ft. high and forms a spreading canopy. The leaves give a fair amount of shade and remain on the tree through the dry season. The tree can be multiplied by seeds and by cuttings; in the latter case large branches during the rainy season.

not exhaust the soil and cacao trees growing quite close to these, not suffer in any way from their proximity.

Other shade tree grown in the Belgian Congo to protect the coffee plants, *Eucalyptus robustus*, is recommended by the writer for French Guinea, South Sudan, and the Brazzaville district.

This tree not only flourishes in irrigated soil, or where the ground is throughout the year, but it grows also on dry plateaux occupied by savannah type of vegetation.

At the Jesuit Mission Station of Kisanre, coffee plants have been under the shelter of *Eucalyptus* trees some tens years old and 50 to 65 feet high, with a very straight trunk. These trees are vigorous, covered with fruit and free from cryptogamic disease; they are planted from 50 to 60 feet apart, while a space of 13 feet is left between the coffee plants. The latter, which for the most part belong to species cultivated in Africa, have adapted themselves perfectly to this association.

growing *Chrysanthemum (Pyrethrum) cinerariaefolium*.

*KANTSCHEDER, JOH. Ueber *Chrysanthemum (Pyrethrum) cinerariaefolium* (die Pflanzenfamilie). (Mittellungen des Komitees zur staatlichen Förderung der Kultur von Kulturpflanzen in Oesterreich Nr. 12). — *Zeitschrift für das Landwirtschaftliche Versuchs- und Lehrwesen in Oesterreich*, Year XIV, Part I, pp. 1-8. Vienna, January 1913.

Investigations hitherto conducted on the chemical composition of the pyrethrum powder and on its active insecticidal principle; cultivation, yields, counts, yield; preparation of the pyrethrum powder, its adulteration and means of detection; trade.

Chrysanthemum cinerariaefolium grows wild on the stony slopes of Dalmatia and Croatia up to 3 300 feet above sea level. It is also cultivated in these two countries, in Bosnia Herzegovina and for the last ten years in the Quarnero islands. The greatest portion of the Dalmatian pyrethrum is yielded by cultivated plants which differ from the wild ones by somewhat larger flowers. Insecticide powders are also prepared from *pyrethrum roseum* and *P. carneum*, which grow wild in the Caucasian mountains and are erroneously called Persian insecticides.

The cultivation of these three species has been repeatedly attempted in France, Algeria and California, but hitherto these countries have not placed on the market any considerable quantity of the drug.

Cultivation of Chrysanthemum cinerariaefolium. — In Dalmatia this plant is grown continuously or temporarily; the former system is mostly followed in the neighbourhood of Sebenico, Traù and on the island of Braù; the latter all over the country, in old vineyards, or old olive orchards and in plots that are to be planted to vines.

The seed is sown usually about the end of March, the seed being covered with a layer of 2 centimetres (0.2 to 0.4 inch.) of fine earth and then with dry leaves.

The seed from the wild mountain plants is used as it has been observed that the species degenerates under cultivation. The seed bed requires fairly rich soil, preferably with a southern aspect. Subsequent intercul-

ture consists in weeding and eventually irrigation during the months. As the autumn is mild, sowing is sometimes done at the end of September and the seedlings planted out in the succeeding months. On average only about half the seeds give rise to plants fit to be set out in the month of March. The soil devoted to this plant may be calcareous or marly, and it must have a southern aspect. It is sown in the preceding autumn, being arranged in furrows 16 inches deep. The seedlings are set out in rows and 16 X 20 inches apart; of every 100 plants set out, 15 to 30 perish and have to be replaced. Flowering begins at the end of May of the same year, but it reaches its maximum only in the third year. During the summer the plants are hoed lightly once or twice. In the second half of May, or if the weather is wet, in June collection of flowers begins. The buds are paid better. An adult can gather in 100 flowers from 1 500 to 2 500 plants. 100 flowers weigh on an average 1 3/4 oz.; one plant produces 80 to 150 flowers; 100 lbs. of fresh flowers yield 25 to 33 lbs. of dried flowers. In Dalmatia the flowers are dried in the shade in layers 1.2 or 1.6 inches deep spread on cloths stretched over frames. The layers are turned over two or three times a day. The "Persian" flowers are first dried in the sun and then in the shade. When the harvest is over the plants are mowed, the ground is hoed in the autumn and again in spring.

The area devoted to this culture in Dalmatia varies very considerably, but it may be set down at 1 700 acres, of which one half is under continuous cultivation. The average yearly production of Dalmatia during the last five years was from 1 500 000 lbs to 2 205 000 lbs of dry flowers. The average prices during the last five years: Dalmatian flowers, open, per lb., still in the bud 10 3/4 d per lb. Montenegro flowers (wild) 1 3/4 d per lb. dearer than the Dalmatian flowers. "Persian" flowers 15 to 18 1/2 d. The prices are however subject to great variations, as were for instance 2d per lb. in 1883 and 18 1/2 d per lb. in 1893.

As for returns, the growing of pyrethrum follows closely that of the vine. It further allows the profitable cultivation of soils which would be suitable for any other crops. The average time that the plants live is 6 years; some attain even the age of 20.

Accounts of pyrethrum growing on 1 acre.

	£	s	d
Preparation of the soil, sowing, and setting out . . .	47	3	6
Winter and spring hoeing, two summer hoeings, harvesting, carriage and esiccation of the flowers, mowing the stems £ 12 16 s 1 d per annum for 6 years	76	16	6
Total cost of six crops . . .	124	0	0
Yield: 803 lbs. of dry flowers per acre per year, at an average price of 8.16 d per pound	163	16	3d

in the difference between outlay and returns, interest on capital has to be deducted.

Dried flowers are ground to powder at Triest (10 mills), Sebenico, Igusa, etc. The principal market of the product is Triest, which buys two-thirds of the production of Dalmatia.

***Carludovica palmata* in Brazil.**

Indeira dos chapéus de Chile e Panamá (Carludovica palmata). — *Chacaras e Quin.* Vol. VII, No. 1, p. 24. São Paulo, Brazil, January 15, 1913.

Carludovica palmata is native to Central America, Brazil, Peru and in Brazil, where it is called "bambonassa", it covers great extents; but it is not industrially utilized. The isolated ribs of young softened in boiling water, then passed successively into a solution of acid and into cold water, after which they are dried, are the material from which the real Panama hats are made. In 1853 and again in 1885 attempts were made to introduce this industry into Brazil; but both times failed. The writer insists upon the possibility and on the advantages of its trial.

The province of Moyobamba in Peru is one of the principal centres of manufacture of Panama hats, which are exported also to Brazil.

Some New Kitchen Garden Plants for 1913.

VIER, MAX. Quelques plantes nouvelles pour 1913. — *Revue Horticole*, Year 83, 3 and 4, pp. 68-71 and 93-95. Paris, February 1 and 16, 1913.

Early Copenhagen Cabbage. — This vegetable is of Danish origin and is one of the early varieties of cabbage in the regularity and size of the head, which is surrounded by relatively short exterior leaves, and in the number. The head keeps for a long time without opening, which is not the case with other early cabbages.

Wassels Sprouts, Merveille des Marchés. — An excellent variety and a great improvement on the Demi-nain de la Halle. Grows erect and its height does not exceed 2 feet. The small, almost spherical sprouts are very hard and smooth; they grow in large numbers in the axils of the leaves and together form a long compact pyramid.

Early Haricot Bean with variegated seeds. — A true dwarf, very productive and hardy. This bean is classed among the early varieties and is suitable for cooking green as "French beans". The pods are numerous and long, often attaining 8 inches; they are of a bright, light green and contain 7 or 8 beans, which are elongated, half black and half white.

Early Butter Beans, Hundred for One. — These resemble in the shape of their beans the Yellow Hundred for One haricot; this new, early variety is to be recommended, as much for its good quality as for its productiveness. The fine, yellow, slightly curved pods are tender, and of an excellent flavour. This bean is vigorous, strong, and hardy and is equally suitable for field culture and for the amateur's kitchen garden.

Summer Bean without fibres (climbing). — This variety attains a height of over 6 ft.; it is strong, full of leaf, light green, and towards the end

of the summer, bears fine pods, green when first cut, but deeply with brick red shortly before ripening. The pods are very thick and brittle, being entirely without fibres; they contain 6 to 7 round yellow beans, with a slight brown ring round the hilum.

Red Globe Onion. — This onion is perfectly round, of average size with a very thin collar; the external envelope is of a fine crimson. The flesh is firm and tinged with pink, the flavour very delicate. It does to do well in all climates, being fairly early, hardy, easy to grow and storing well.

Red half-short cylindrical Carrot for forcing. — This vegetable has been especially selected with the view of obtaining a larger crop, retaining the precocity, light foliage, and qualities necessary in early marketables. The roots are 2 to 2 ½ inches long and about half this in diameter. They are absolutely coreless.

Curly Extra Blonde Lettuce. — Somewhat similar to Blonde de Gâtinais but of a more golden colour, the edges of the leaves being more wavy and curled. Its chief advantage is the long time which its very large and heavy head lasts. It is very drought-resistant.

Blonde Monstreuse Slow-growing Sorrel. — The result of a selection from the Très Large de Lyon variety, and remarkable for the size of its very light-coloured leaves; these are nearly 12 inches long and 4 inches wide at the base. This improved sorrel runs up to seed very slowly, but it is extremely productive, and will be unrivalled for market garden and private garden cultivation.

Invincible Tomato. — A very early, and productive variety with round fruits of a fine red colour.

The plant is of medium height, with light foliage, which does not intercept the sun's rays.

Ruby Tomato. — Fruits spherical of medium size; skin bright red, quite smooth; very heavy, with very firm flesh. This plant is strong and productive, and has somewhat thickset foliage. Almost as early as the very early varieties, this tomato has the great advantage of a much longer yield.

375 - Artificial Truffle Grounds.

PRADEL. Truffières artificielles. — *La Vie Agricole et Rurale*, Year 2, No. 12, pp. 1-3 Paris, February 1913.

As a check to the deforestation which is taking place every year and is accompanied by danger of all kinds, the writer suggests the planting of truffle oaks wherever the nature of the soil permits, and mentions the principal factors which he has found, during thirty years of practical experience, to be necessary for the creation of artificial truffle grounds.

Climate. — A temperate climate is one of the first requisites for the production of truffles, while that of Périgord is particularly favourable to truffle production according to Mr. Chatin, there are 53 departments of France in which truffle fungi are grown.

inude and aspect. — A southern aspect is the best, but excellent can be obtained with a northerly one. The best land is moderately and between 100 and 600 m. (300 and 2 000 ft.) above sea-level. *Soil.* — Marly soils (so-called oolitic), more or less ferruginous and with a friable sub-soil are the most suitable. The essentials are that the soil should be light, porous and fairly rich in humus, and that the subsoil should allow the rain-water to drain away. The ideal would be a stratum sufficiently compact to hinder the penetration of the taproots of the truffle-bearing tree and at the same time containing enough fissures to permit of the passage of water. This type of rock promotes the development of the spreading roots on which the mycelium grows and the truffles.

Where truffles are found growing wild, it is certain that the soil is suitable for their production and the "true black truffle-bearing oak of Périgord" can at once be planted.

Plants. — The hazel, juniper, chestnut, pine, etc., have been mentioned as suitable for growing truffles, but the common oak and *Quercus nigra* (1) alone are of value: only these produce really black highly flavoured truffles (*Tuber melanosporum*).

In order to multiply these suitable trees it is necessary always to sow them in nurseries, for trees raised from seed and not transplanted produce truffles, because they only possess a tap-root, and this grows at the expense of the lateral roots to which the truffle mycelium eventually attaches itself.

Preparation of the Soil. — Ploughing is done in the autumn before the trees are put out, or if the ground is difficult to work holes of 16 inches in diameter are made. As a general rule, it may be said that close ploughing hastens the formation of truffle grounds, but they do not last so long. It is therefore recommended to plant in rows 16 to 20 ft. apart, with 16 ft. between the trees; this gives about 320 trees per acre. It is well to plant vines between the rows (preferably direct bearers) or sainfoin, etc., the presence of these plants promotes the development of truffles.

The work necessary before the time of the growth of the fungi, consists of the spring ploughing of the plantation; when the truffles begin to appear the soil should be worked lightly with a two-pronged hoe in such a way as not to disturb the truffle bed, which consists of a stratum of compact soil, while the layer above is light and friable (*terre de meuble*), having been altered by the action of the mycelium. One acre of cultivated land if converted into a truffle ground gives an annual return of £12 to £13.

Probably *Q. nigra* Thore, = *Q. Toza* Gillet.

(Ed.).

376 - A New Method of Pruning Young Vines.

VILLEPIGNE, R. Une nouvelle taille des jeunes plants de Vigne. — *La Vie Rurale*, Year 2, No. 10, pp. 283-284, fig. Paris, February 8, 1913.

The writer being struck with the gaps which occur annually in vineyards and the dangers incurred by the year-old rooted grafts employed to replace the missing vines, suggests that recourse should be had to rooted grafts which have already been two years in the vineyard, treating them as follows:

After the first season in the nursery, they should be cut immediately below the unripened wood (no attention being paid to the fragility of the internodes), and all the buds situated below the upper three or four eyes must be nipped off.

During the second year that the graft is in the nursery, these buds, or any way two of them, develop and after the second season two shoots, each pruned to four or five eyes, will give rise to two buds at a suitable height.

The vine is then replanted with all its roots in the vacant hole and the branches are bent and at once tied at the required height. The buds thus need care are thus at the same height as the neighbouring branches and cannot escape the notice of the labourer.

These substitutes bear grapes from the first year of planting and the writer has found 80 to 100 per cent. successful; thus he is much pleased with this method, which allows of a vacant space being at once filled by a weak vine being removed and replaced by a young productive one.

M. Villepigue is the owner of substituted vines, and even of vineyards, planted in this way and dating from 1907; he declares the fear of the plants dying from bearing fruit too young is quite unfounded and that the parts of his vineyard which he has thus replanted are the most flourishing and productive.

377 - Research on Grapes Without Pips.

MANARESI ANGELO. Ricerche sulle uve senza semi. — *L'Agricoltura Bolognese*, Year VII, No. 11, pp. 165-168 and Year VII, No. 1, pp. 1-4 Bologna, November 1911 and January 1913.

The development of pipless grapes (with the exception of sultana and currants only takes place under certain circumstances. When immediately after flowering, the fertilized ovules of a bunch are involved in a struggle for existence with unfertilized ovules, the possibility of the development of the latter depends almost exclusively on:

a) Primarily, the variety of vine.

b) The nutritive substances. "In a bunch with many fertilized flowers, the unfertilized are so much at a disadvantage in the struggle for obtaining the nutritive substances present, that they fall off without developing, while if the number of fertilized flowers is small, the unfertilized ones persist and produce pipless grapes." (Müller-Thurgau). Nevertheless this statement must not be taken too literally, since in many varieties the bunches always contain a few grapes without pips.

Finally, Müller-Thurgau, basing his theory on observations made, considers that the stimulus of the growth of the pollen tube may be, in the absence of opposing circumstances, to the development of a grape without pips.

The number of such pipless fruits on the same vine varies from year to year, as it depends upon unfavourable conditions of pollination and fertilization, which by hindering the formation of grapes containing many nutritive substances at the disposal of the unfertilized ovules, which give rise to pipless grapes.

Müller-Thurgau has shown, in the case of Swiss grapes, the higher percentage of hydrocarbons and of other organic substances existing in stocks which have been ringed, favours the development of pipless grapes, not at all, as a rule, of fruit with pips, but from flowers, which otherwise have fallen.

The writer thought it useful to repeat these experiments on Italian grapes, observing at the same time the effect of ringing upon the produce. Experiments were made on Trebbiano, Alionza, Bottora, and a variety popularly known as Albanone. These (with the exception of Chasselas Napoléon, Termarina, Querciola, Lambrusco, Gamay, Cabernet Franc, Moscatello, Uva Passerina of Tuscany, etc.) produce alongside of very large grapes furnished with pips, a smaller number of small pipless grapes, which have the peculiarity of ripening some days earlier than the others and which never attain the same sugar content. The relative number of grapes with and without pips is never constant, and it is noticeable that, in bunches where many grapes are pipless, the grapes of both kinds (with and without pips) are usually large; the reverse is the case where pipless grapes are few or completely wanting.

Table I gives the data obtained by examining two vines of Albanone (I) and one of Moscatello (IV).

TABLE I.

Bunches with many pipless grapes				Bunches with few pipless grapes			
Normal grapes		Pipless grapes		Normal grapes		Pipless grapes	
Number	Average weight gr.	Number	Average weight gr.	Number	Average weight gr.	Number	Average weight gr.
103	1.631	772	0.185	214	1.495	52	0.154
173	2.110	170	0.165	264	1.580	1	0.140
116	2.647	253	0.324	321	2.349	49	0.306
193	2.093	668	0.217	502	1.878	3	0.367

Experiments on ringing (carried out before the flowering) gave results shown in Table II:

TABLE II.

Vines	Date of Vintage	Ringed vine		Unringed vine	
		Number of grapes	Average weight of one grape gr.	Number of grapes	Average weight of one grape gr.
« Albona » {	grapes with pips	17-IX	778	3,224	811
	» without »	»	880	0,551	0
« Bottona » {	» with »	»	343	4,073	744
	» without »	»	191	0,597	35
« Albanone » I {	» with »	21-IX	692	1,968	689
	» without »	»	179	0,246	39
» II {	» with »	»	207	2,488	548
	» without »	»	252	0,286	12
» III {	» with »	»	921	1,947	1009
	» without »	»	63	0,373	87
« Trebbiano » {	» with »	30-IX	1760	2,109	1113
	» without »	»	0	—	0

As is seen, the number of pipless grapes is much larger on the vine (except in the case of Albanone III), which confirms the facts of by Müller-Thurgau, Sannino, and Tossatti and by the writer him 1910. The average weight of the grape, with, or without pips, usually greater in the case of ringed vines.

The formation of pipless grapes in the place of normal ones diminishes the production on account of the considerable difference in weight existing between the two. In October 1910, the writer got all the bunches (200) produced by three Albanone vines and states they were divided as follows:

2641 pipless grapes average weight 0.137 gr.
 3240 grapes with pips » » 2.130 »

The loss of crop is thus very noticeable, all the more as it is a question of young vines which have only just begun bearing.

To prevent this loss, it is necessary to promote pollination, especially cross-pollination, in every possible manner:

- 1) Growing in the same row varieties in which this phenomenon alternately with others capable of acting as sources of pollen.
 2) Artificial pollination is of great assistance in the case of table grapes and especially in greenhouses, but is too costly for cultivation on a large scale.
 3) In vineyards, the only possible way of preventing the flowers from being fertilized by repeatedly sulphuring the plants while in flower. According to the writer, the agitation of the air produced during this process gives rise to an intense pollination and this view is confirmed by experiments made by the writer in 1911, as shown in Table III.

TABLE III.

	Ringed vine			Unringed vine		
	Number of bunches	Number of grapes		Number of bunches	Number of grapes	
		with pips	pipless		with pips	pipless
not sulphured)	21	78	1243	19	160	624
sulphured . . .	25	219	1616	24	571	210
. . .	13	99	829	26	231	299

The ringing was effected before flowering on the 4th of June; the vines were sulphured on June 21, 23, 25, 27 and 29, and July 2, 4 and 6.

Horticultural Research at Woburn.

See also, S. in *Science Progress*, Nos. 26 and 27, pp. 281-291 and 397-412. London, October 1912 and January 1913.

The Woburn Experimental Fruit Farm was started in 1894 and the results of 17 seasons are now available for discussion. In many cases these results are directly contrary to accepted practice, and in fact experiments which were started with the idea of proving an object lesson in malpractice have reached conclusions in the opposite direction.

Planting.— Nearly 2 000 trees and bushes have been planted on 20 different soils, and in 8 different counties, with the object of ascertaining the effect of ramming the soil while planting, that is to say pounding the soil so that it is effectually puddled. An analysis of the results shows that

72 % were favourable to ramming.
 17 % " ambiguous.
 11 % " unfavourable.

The rammed trees were much more vigorous in every way, and their density as measured by increased growth was equal to 50 per cent. on

an average. With such a method of planting, some damage must be done to the roots, and each item of such damage as well as of other proposed bad practice in planting has been the subject of separate experiment. Shortening the roots up to removing one-third of their total length was beneficial, as also did removing all roots less than 2 mm. in diameter, the loss of vigour has followed the removal of those up to 4 mm. In some cases the roots were bent and even tied in knots, and in others the roots were roughly broken instead of being carefully trimmed, without any detriment to the tree. These somewhat surprising results are quite natural when remembered that the life of the tree depends on the formation of new roots and not on the preservation of the old ones, and moreover that the majority of new roots do not even form near the ends of the old ones. In a number of cases investigated it was found that with apple on grass stock only 15 per cent. of the new roots were formed within $\frac{1}{4}$ inch of old root ends, 15 per cent. started from the stem itself, and 70 per cent. started from other parts of the main roots.

With regard to the proper depth for planting this must vary with the nature of the soil and the habit of the plant, but will generally be 6 to 12 inches below the level of the soil; small variations of say 4 inches either way have been found to be quite immaterial, as the new roots have no difficulty in making their way to the level at which they flourish. Trenching preparatory to planting has been tried on five different soils, has been shown to have little effect when measured either by the behaviour of the trees or by the alteration in the water and nitrogen content of the soil. The air supply of the roots was limited in some experiments by enclosing an iron drum 18 inches deep and 3 feet in diameter around some trees, and covering the top 2 inches with cement. After 4 years the trees were apparently unaffected by this treatment. Since then they have fallen behind similar trees which were not enclosed, but this is possibly due to exhaustion of the limited amount of soil available for growth and not to lack of aeration.

II *Pruning*. — The importance of "cutting back" i. e. removing one or two-thirds of each branch of a young tree when transplanted, was shown by leaving some young apple trees uncut. Their leaves showed a 25 per cent. deficit in size and little or no new wood was formed; but given this operation was performed before the period of active growth commenced, it might be delayed till April without detriment. With regard to the annual branch pruning three treatments were tried in various positions: 1) normal, or the removal of $\frac{1}{3}$ of each new shoot; 2) hard, or the removal of $\frac{2}{3}$ of each new shoot; 3) no pruning.

The relative sizes were as follows:

	normal	hard pruned	unpruned
After 5 years	100	87	133
" 10 "	100	82	107
" 15 "	100	87	102.5

These results leave no doubt that the less a tree is pruned the larger it is. At the same time it was shown that growth as measured by the total amount of wood including clippings is least in the hard pruned trees; efficiency in growth is greater in height and spread than in the girth of stems. The weight of fruit from unpruned trees was double that of the normally pruned trees and about four times that of the hard pruned trees, and the increase in crop was not accompanied by a marked reduction in the size of the fruit. Taking an average of 10 years the apples of unpruned trees were 4 per cent. smaller than those of the normally pruned trees and 18 per cent. smaller than the hard pruned trees.

These results naturally apply only to young trees; with older trees branch formation is comparatively insignificant, severe pruning reducing the production of new wood to be tripled. Having established the fact that the growth of a tree varies inversely with the amount of pruning, it must be borne in mind that the growth of a young tree must be conditioned so that when it comes into bearing it will carry its crop to the best advantage, and to this end some pruning will be necessary. As a general principle it would be advisable to do a certain but not too great amount of pruning for the first 5 or 6 years after planting, at the same time the annual pruning may be reduced to the removal of the few inches of twigs which usually consist of imperfectly ripened wood. Pruning has been performed in early autumn, in mid-winter including the coldest weather, and in spring, without obtaining any appreciable differences, but the results with regard to summer pruning are still somewhat ambiguous. That trees should be pruned to outside buds, also that the cuts should be slanting and close to the bud appear to be unimportant; in fact, with regard to the latter, trees pruned 2 inches above a bud are always done better than those pruned in the orthodox way, not because the bud is weakened by having the wood cut away so close

to the bud. With regard to *root pruning*, some trees that were root pruned every year only attained 75 per cent. of the size and 44 per cent. of the produce of unpruned trees after 15 years; others that were root pruned every year only attained 35 per cent. of the size and bore an insignificant amount of fruit, and lastly others that were root pruned every year all died before 15 years. Thus, root pruning is shown to be a very severe check to growth and should be rarely resorted to, though it may be inevitable in the case of a strong-growing wall tree.

Manuring.—21 plots each containing 18 dwarf apple trees were divided into three groups: 1) received a normal dressing of manure (12 tons of farm-manure per acre or its equivalent in artificials); 2) received less than normal or none; 3) received more than the normal (up to 10 times the normal or 30 tons of dung).

After 17 years, the annual measurement of the leaf size, a triennial measurement of the trees, and the annual records of the value of the crops showed no differences, and the results are the more astonishing as the soil is not particularly fertile: the layer of good soil is only 7 in-

ches deep and beneath it is a stiff clay subsoil which the roots of the trees penetrate with difficulty. After the first 10 years, one lot of trees removed, the manurial treatment continued, and farm crops grown; it was found that with these crops the manures had the ordinary effect which they have on other soils. The experiment with apple trees was repeated in a very poor sandy soil, and here the effect of manuring was very considerable, showing that the method of experimentation was in fault.

On the other hand, with bush fruits on the Woburn soil, manures proved absolutely essential, and dung far superior to artificials except the case of strawberries.

Measurement of Results. — The total weight of the crop and the average size of the fruit must always be supplemented by data less dependent on seasonal fluctuations; *viz.* growth must be measured. In order to do this when the experiment is a short one, lasting 3 or 4 years, the tree is lifted and weighed. With longer experiments, measurements are made of the height, of the spread of the branches, of the girth of the stem or of the length of wood formed during a season, or the relative size of the leaves is determined. The results obtained by these various methods have been compared with each other and with the determinations of dry matter and nitrogen in the leaves. They all show a substantial agreement, though naturally the magnitude of the differences is not the same.

379 - Australian Mangrove Bark.

COOMBS, F. A. and ALCOCK, F. — *Collegium*, No. 514, p. 62-4-fig. 1. Frankfurt Feb. 1, 1913. — (Abstract from *The Leather World*, 1912, p. 850).

The writers discuss the probabilities of a successful starting of a mangrove extract industry in Australia. They mention the difficulties of finding the most suitable places for a centre of such industry, being themselves in favour of Cairn and Cooktown on the Queensland coast. Three different kinds of mangrove bark are distinguished, *viz.* *Rhizophora mangle* Lam., *Bruguiera gymnorhiza* Lam., and *Ceriops Candolleana*. *Rhizophora* is the most important of them, representing fully 75 per cent of the trees which it would pay to strip; it is characterized by its roots growing above the water on the water side of the mud and banks, while *Bruguiera* appears to grow best where the banks begin to shelf off to higher and firmer ground. The two are usually known by the name of black mangrove. *Ceriops* is the least common of the three and does not yield anything like the same amount of bark as *Rhizophora* or *Bruguiera*.

The amount of rosin influences considerably the analytical figures obtained, as rosin only shews 6 per cent. tannin (average) while the bark contains about 30 per cent. The various mangrove barks have different thicknesses of rosin, and *Rhizophora* shews an average percentage of 22.6, *Bruguiera* 37.5 and *Ceriops* 28.8. The analyses of mangrove barks given later are carried out on the bark with the rosin on. Barks freed of rosin would of course shew distinctly higher figures.

regards drying of mangrove bark, the writers recommend to collect bark from the strippers at regular intervals and carry it by boat to a convenient drying centre. 100 lbs. green wet bark yield 66 lbs. (average) dry bark of 10.3 per cent. moisture. It was found that the largest (and oldest) trees carry the stoutest bark and the highest tannin value (see table).

	<i>Rhinophora</i>					<i>Bruguiera</i>			<i>Ceriops</i>	
	4	8	10	12	16	5	9	15	4	10
ins.										
%	28.2	30.3	34.0	38.6	40.4	25.8	29.8	36.4	25.8	32.4

The tannin figures (official method) of different barks, calculated on per cent. moisture, are given in the next table, where a few figures for East-African mangrove barks are added for comparison.

	<i>Rhinophora</i> (21 samples)		<i>Bruguiera</i> (8 samples)		<i>Ceriops</i> (6 samples)		Passier's tannin fig.
	% tan	% non-tans	% tan	% non-tans	% tan	% non-tans	
1.	23.1	10.6	29.1	9.0	30.5	11.4	36.5
2.	40.4	12.7	36.4	11.8	32.4	15.0	35.8
3.	28.2	7.7	23.6	7.0	25.8	7.9	25.8

LIVE STOCK AND BREEDING.

Experimental Researches on Liver-fluke (*Fasciola hepatica* L.).

ALF. MOUSSU and HENRY. Recherches expérimentales sur le développement de la v. hépatique. — *Comptes Rendus des Séances de l'Académie des Sciences*, No. 1, 95-97, Paris, January 6, 1913.

The writers have made researches on the development of *Fasciola hepatica* L., which have led to results somewhat different from the observations of Messrs. Leuckart and Thomas. The writers introduced into the body of a lamb fourteen weeks old, born and reared at Alfort, 18 snails (*Helix minutus*) which contained rediae; after 52 days, the condition of the animal was as follows:

The animal was somewhat easily disintegrated and injured only on the left side; in the parenchyma of this part of the liver there were

canaliculi which contained 10 sexually mature liver-flukes 8 mm. and 3 mm. broad.

The writers made the same observations in the case of an ox, which was attacked by liver-flukes and had been brought to Alfort, where it was slaughtered 42 days later. Although the development of the parasites was normal, their length was only $\frac{1}{3}$ of that of the adult flukes. From this fact, the writers conclude that three months are necessary for these parasites to develop within their host and not six weeks, as was stated by M. Thomas.

As in both cases the flukes were found in the liver parenchyma instead of in the bile ducts, the writers think that the parasites reach the liver from the blood and not by means of the bile-duct. This mode of transmission is probable, as the animals which were much attacked by *Fasciola hepatica* suffered from inflammation of the inner lining of the upper and lower veins of the liver and even of the inferior vena cava. The writers also draw attention to cases in which the liver-fluke has been found in other organs. Messrs. Waldmann and Bock found these parasites in the liver of sucking calves and M. Frommann even discovered them in the foetus of sheep, in which case the explanation of their presence was their introduction within the uterus. Experiments made by the writers have shown that the direct entrance of the fluke larvae into the bodies of animals is not possible.

381 - Annual Report of Veterinary Officer Investigating Camel Diseases for the Year Ending March 31st, 1912.

Lahore, Punjab (India), 1912.

This report deals especially with "Surra" and also mentions other diseases to which camels are subject.

The occurrence of a thirteenth pair of ribs in camels is spoken of at the conclusion.

382 - A Note on Some Interesting Results Following the Internal Administration of Arsenic in Cancer and Other Diseases of the Foal and Horses.

HOLMES, J. D. E. - Agricultural Research Institute, Pusa, Bulletin No. 32, Pusa.

The writer administered arsenic internally in the control of "Surra" in horses; he found that this remedy had a very satisfactory secondary effect upon four animals, which were suffering from foot cancer, the latter being quickly cured by large doses of arsenic.

383 - Experimental Studies on Contagious Agalactia (Deficiency of Lactation) in Goats and Sheep.

MARCA, ROCCO and COCCIANTE, NICOLA. Studi sperimentali sull'Agalassia contagiosa degli ovini e caprini. - Special reprint from the Giornale della Reale Società Italiana di Veterinaria, Year LXI, Turin, 1912.

The writers give first a short review of the various works published dealing with the contagious agalactia of sheep and goats.

pass on to a detailed account of the disease. The chief symptoms latter are fever, alteration of the lacteal glands, joints and eyes animals; but, as a rule, the former are alone affected. The writers were able to produce the malady artificially in healthy by means of sub-cutaneous injections of the blood or milk filtrate from diseased animals. Further, they were able to prepare a for immunisation against contagious agalactia, which has proved very efficient.

The Investigation and Value of Perilla Cake and Mowrah Meal.

— HONCAMP, F., MEICH, M., and ZIMMERMANN, H. Ueber Perillakuchen und Mowrah-Mehl. (Mittheilung der landwirtschaftl. Versuchsstation Rostock). — *Die Landwirtschaftlichen Versuchsstationen*, Vol. LXXVIII, Parts V and VI, pp. 321-347 + tables I-IV. No. 12, December 30, 1912.

— BREDEMANN, G. Ueber Presskuchen der Perillassat. (Mittheilung der landwirtschaftl. Versuchsstation Harleshausen, Cassel). — *Id.*, pp. 349-365 + tables V-VI. As is well known, oil cakes are much in request for feeding cattle owing to their high protein content and to the large amount of fats sometimes contained. Lately perilla cakes have again made their appearance on the market; these are made from the perilla plant, a Labiate cultivated in China, and sub-tropical Japan for the sake of the oil extracted from its seeds. The production of oil is estimated at 110 000 gals. and is especially imported from Japan where it is used as substitute for linseed oil.

Chemical analysis and feeding experiments on Shropshire lambs gave following results compared with those obtained with meadow hay :

	Substance		Coefficient of digestibility per cent
	In natural state per cent	Dried per cent	
Water	12.30	—	—
Crude protein	36.31	41.40	87.0
Crude albumen	35.20	40.14	—
Nitrogen-free extract	19.74	22.51	48.7
Crude fats	7.05	8.04	87.7
Crude fibre	16.28	18.56	7.0
Cellulose	8.32	9.49	—
Starch matter	—	—	56.3
Organic matter	—	—	60.4

From the above are obtained :

	Nutritive substances	
	Crude per cent	Digestible per cent
Crude protein	41.40	36.02
Nitrogen-free extract	22.51	10.96
Crude fats	8.04	7.05
Crude fibre	18.56	1.30

On the basis of a nutritive value of 90 % per 100 lbs. we have:

	Digestible albumen lbs.	Starch value lbs.
Dry matter	34.76	53.7
Matter in natural state with 12 % of water	30.56	49

Taking the commercial value of digestible albumen in 1911 (Rohr Mecklenburg) at 1.29d per lb., and that of the starch value at 1.20d per lb. we have:

49 X 1.20 =	45 10.68 d
Supplemented by 30.56 of digestible albumen at 0.168 d per lb.	5.13 d
Total	50 3.81 d

It must be noted that the prices quoted in 1911 for concentrates were very high.

Cakes of *Bassia latifolia* Roxb. ("Mowrah") were found on examination to contain in a dry state and free from fat from 29 to 31 per cent saponin; they are therefore to be regarded as poisonous to domestic mals. In fact, even when diluted to 3.2 : 30 000 and 3.4 : 30 000, they have a haemolytic effect on the blood of the latter. Consequently only they have been freed from saponin and examined in a laboratory can be used as food. As for the use of Mowrah cakes as a fertilizer, there found in a ton:

		s.	d.
Nitrogen	57.46 lb. at 6.40 d	30	7.5
Phosphorus pentoxide	22.52 " at 1.17 "	2	2.3
Potash	76.42 " at 0.64 "	4	0.9
Lime	6.09 " at 0.05 "	0	0.3
		36	11.5

Considering the form in which the nitrogen occurs and the inert substances, Mowrah cakes used as a fertilizer cannot fetch more than about 30 shillings.

Amongst the species of perilla used for the production of oil are the following should be distinguished: *P. ocymoides* L. the most common, *P. arguta* Benth., especially cultivated in Japan, and *P. nankinensis* especially grown in India. The anatomical and microscopical characters of the three species are given. The reticulated cells occurring in the external layer of the integument are characteristic; it is, however, difficult to distinguish cakes made from *P. ocymoides* from *P. arguta* but this is practically of no importance.

Tomato Seed Cake.

DEI, JAMES. Un nuovo prodotto per l'alimentazione del bestiame. — *Società degli Scrittori Italiani, Bollettino quindicinale*, Year XVIII, No. 4, pp. 126-127. Rome, February 28, 1912.

A factory at San Giovanni a Teduccio, near Naples, has commenced industrial manufacture of tomato-seed cake.

The residues from the tomato-preserving factories, as soon as they are collected and before they have time to ferment, are dried in an esicador and then passed through a series of machines which separate the meal from the seeds; the latter are then ground and from the meal the oil is pressed out by hydraulic pressure. The composition of the resulting cake is as follows:

Water	10.10 per cent.
Dry matter	89.90 " "
Crude fat	11.63 " "
Crude protein	38.13 " "
Pure protein	33.44 " "
Digestible protein	23.75 " "

In feeding trials conducted at the Royal Higher School of Agriculture at Schyz with Schwyz milch-cows, tomato cake proved to possess the same food value as linseed cake.

Method for the Determination of the Amount of Hulls in Cottonseed Meal.

DEI, C. J. Methode voor de bepaling van het gehalte aan katoenzaadschillen in katoenzaadmeel. Rijksproefstation voor zandcontrole (Afdeling Microscopie der Voedselmiddelen). — *Departement van Landbouw, Nijverheid en Handel, Directie van den Landbouw, Verslagen van Landbouwkundige Onderzoekingen der Rijkslandbouwproefstationen*, No. XII, pp. 34-47 (46-47). The Hague, 1912.

Lately the hull content of cottonseed meal has been determined by the following method: The sample is placed in a tall glass and 300 cc. of boiling water is added. The glass is left standing for at least four hours, and then the fluid is poured off, the sample being turned out onto a piece of muslin 15 X 15 cm., with 100 g. of meal. The four ends of the muslin are gathered up together and the mass is pressed with the fingers, in order to break it up. The mass is replaced in the glass and water poured on it. When the hulls have sunk to the bottom the floating parts are decanted off. Then the glass is again filled with water; when the heavier hulls lie at the bottom of the glass the supernatant fluid and the smaller hulls and coarse portions of meal are turned out upon the muslin. Then the mass is placed in a mortar and the lumps are pounded with a pestle covered with india rubber. The mass must be placed once more in the glass, and as soon as the hulls have sunk, the supernatant parts of the meal are poured off. These operations are continued until all the meal is removed. The remainder, consisting of the hulls,

is dried and weighed. The content of hulls determined must be multiplied by the factor $\frac{100}{72}$. This factor has been empirically determined. The limit of the hull content of cottonseed meal is 15 per cent.

387 - Stock Breeding in Morocco.

GROEFROY SAINT HILAIRE. L'Elevage au Maroc. — *La Vie Agricole et Rurale*, No. 11, pp. 314-318. Paris, February 15, 1913.

There are important breeds of stock in the north-western part of Morocco; but although the natural conditions are favourable to stock-keeping, the number of animals is relatively small. The reasons for this are: the regulations in force forbidding the export of horses and sheeps, carelessness in breeding, and want of security. The writer believes that the number of animals bred could be quadrupled.

I. Horses. — These are only bred for home use; but though no systematic scheme is followed, certain stallions are often preferred to others. In appearance, the horses differ little from the Berber breed. They have high hocks, their heads are heavy, and their croup is falling. The chest and lumbar regions are well developed. The writer fears that the few and carelessly bred animals will not suffice for future needs; therefore recommends the establishment of local studs, the improvement of the horses by crossing them with Arab thorough-breeds and the raising of the order forbidding export.

II. Mules. — These are bred almost entirely in the mountain districts. The price of the Moroccan mule, like that of the Algerian, which it resembles, has greatly increased of late years, having doubled in 10 years. This fact will doubtless give an impetus to mule-breeding.

III. Cattle. — Cattle-keeping is the most important branch of agricultural industry in North-West Morocco. The animals are pure red in colour and have straight faces and lyre-shaped horns, which bend upwards. The horns are light coloured with black tips; the height at the withers averages just on 4 ft. The Moroccan cattle are distinguished for their fine shape; they are good milkers and fatten well, but are also suited for work. The daily milk yield is from one and a half to two gallons. The carcass weight of animals of 660 lbs. is 50 per cent. of the live weight.

In the opinion of the writer, the Moroccan cattle could be greatly improved and easily improved.

IV. Sheep. — These are nearly related to the Merino breed. Their special characteristics are: heavy fleece, a large dewlap and folded neck; the folds extend over the neck to the shoulders and often even betwixt the chest. The face line, in the case of ewes is straight, but it is curved in rams. The face, as well as the upper parts of the legs, is covered with wool; the latter is fine and regular and is much prized as an article of commerce.

As the export of sheep is forbidden, these animals are only kept by the natives for their milk, skins and wool. The writer recommends that they be selected, or crossed with "Mérinos de la Crau", in order to improve their fattening properties.

Canadian National Live Stock Records for the Years 1909, 1910 and 1911.

Ottawa, Canada, 1910, 1911 and 1912.

Amongst other information, this report contains a list of the Canadian Breeders' Associations, together with a short review of their work, information respecting breeds and the number of breeding animals imported into Canada during the years in question (horses imported in 1911: 2651; of which 1367 were Clydesdales and 540 Percherons), the conditions for the importing of breeding animals into Canada, and a list of recognized Canadian and foreign herd-books. Lastly, the quarantine regulations for imported animals are also given.

Horse Breeding in Prussia during the Last 25 Years.

STÜTTINGEN. Die Pferdezucht Preussens in den letzten 25 Jahren. — *Illustrierte landwirtschaftliche Zeitung*, Year 33, No. 13, pp. 103-105. Berlin, February 12, 1913.

In 1888, Prussia imported 87 066 horses and exported 11 596; in 1912, imports were 132 007 and the exports 8 038 head. A decrease in the number of imported horses was brought about by the Stud Master in the selection of those breeds which could be bred in the country. This especially affected heavy breeds, of which the importation, thanks to the successful breeding efforts, has decreased of late years. In 1888, 214 local stallions served 14 649 mares of different breeds. In 1912, 798 local stallions served 46 392 mares (mostly Belgians). At the same time the keeping of private stallions has been furthered. While in 1888, few heavy-bred private stallions were kept, in 1912, 1302 of such stallions served 65 671 mares.

Little progress has been made in carriage horse breeding. The writer states that the only progress which has been made in this direction has been with trotters; although this branch of breeding is still in its infancy and only indirectly supported by the State, it has nevertheless attained results.

The most difficult task of the Stud Direction was the promotion of breeding horses for the army. The Prussian army requires 11 400 remounts yearly; of these 8 700 are bred in East Prussia. While in 1888, in the provinces which supply these remounts, 1175 local stallions served mares, in 1912 the number of the former had risen to 1933 and the latter to 115 210. At the same time, the keeping of private stallions was encouraged. The loan of £1433 made to the Breeding Associations in 1888 has since been raised to £8582.

Other measures for the assistance of breeding army horses are: the establishment of two local studs and the renovation of a third, the formation of three principal studs, the adoption of pedigrees, the selection of animals by qualified persons appointed by the State, the granting of prizes to breeders of winners on the race-course, and the raising of premiums for mares, foals, etc., in the different provinces.

Great success has also been obtained in breeding thoroughbred stock. This is furthered by the regulations affecting the bookmakers' prizes, and race-courses.

390 - Feeding Beef Cattle in Alabama.

GRAY, DAN T. AND WARD, W. F. — U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin 159, 56 pp. Washington, 1912.

A. — In the first experiment, 60 young steers (2-3 years old) were used. None of them were purebred but all had been graded up by the Hereford, Aberdeen-Angus and Shorthorn sires.

The following were the rations given during the fattening time 84 consecutive days.

Average daily rations for each steer by 28 - day periods.

Period	Lot I: 20 steers			Lot II: 20 steers			Lot III: 20 steers
	Cotton-seed meal	Cotton-seed hulls	Corn silage	Cotton-seed meal	Cotton-seed hulls	Johnson grass (1) hay	Cotton-seed meal
	lbs	lbs	lbs	lbs	lbs	lbs	lbs
First 28 days	4.64	14.88	22.57	4.64	13.58	9.43	4.64
Second 28 days	6.00	15.27	19.49	6.00	15.11	8.87	6.00
Third 28 days	7.73	24.79	—	7.73	14.21	7.03	7.73

In this experiment, corn silage was used as supplementary feed to the cotton-seed hulls. The average gains in live-weight per day per steer for the entire period were: Lot I, 1.8 lbs; Lot II, 1.54 lbs; Lot III, 1.71 lbs. Thus Johnson grass proved to be a less satisfactory supplementary feed than corn silage. In Lot I, the steers made the best gains.

B. — Another experiment was made to ascertain whether it paid well to fatten cattle in the open without any shelter as to fatten in the cow shed. The cattle used in this test were a mixed lot of animals: steers, heifers and cows. They were divided into two lots. The rations from December 16, 1910 to March 28, 1911 consisted of cotton-seed meal and cottonseed hulls. The amount of food used, the weight attained, the cost of the fodder and the sale price of the cattle are given in tables.

In Lot I (kept under shelter and provided with straw) the net live-weight was obtained at a slightly lower cost than in the case of Lot II, which was fattened entirely without shelter.

1) Johnson grass = *Sorghum halepense*.

A third experiment, which was carried out according to the same three consecutive years, was undertaken to ascertain whether it was profitable to extend the summer fattening throughout the year (in which case only a small amount of cottonseed cake, from 1 to 4 lbs. per head and per day is used) or to reduce the time by using somewhat larger amounts of cottonseed cake (3.24 lbs. per head and per day). Experiments in all cases proved that the latter method was more remunerative.

The Influence of the Stage of Lactation on the Composition and Properties of Milk.

CHILES, C. H. and SHAW, ROSCOE, H.-U. S. Department of Agriculture, Bureau of Animal Industry, *Bulletin* 155. Washington, 1913.

The milk of 11 similarly fed cows (3 Jerseys, 3 Holstein-Friesians, 3 Jerseys and 2 Ayrshires) was tested throughout a whole lactation period and its composition determined. The date of calving, the butter production for every 4 weeks, and throughout the whole lactation period, as the production of the other components of the milk during the same period are given in tables.

Variations in milk yield and in the content of fat, total of proteins, and milk sugar are represented by means of diagrams, which also show the relative size of the fat globules in the milk of the cows of the different breeds.

Information is also given regarding the melting point of the milk fat; refractive index, the Reichert-Meißl number, etc. The appendix contains the total of the results of weekly analyses of the milk of each cow separately. A shorter account of these investigations is to be found in *Bulletin No. 156 of the U. S. A. Bureau of Animal Industry*, where the differences between the different breeds are especially brought forward.

Royal Jersey Agricultural and Horticultural Society.

Annual Report for 1912. Jersey, 1913.

This report contains among others the conditions of the admission of bulls to the Jersey Herdbook, the results of the Butter Tests held by the society in May and October, a list of the prize-winning animals in 1912 and the lists of prizes for 1913, together with a scale of points for the different breeds of bulls.

The Decline of Commoning (1) Flocks of Sheep in South Germany.

WILHELM, H. Der Rückgang der Gemeindegeweidereien in Süddeutschland. — *Zeitschrift für Landwirtschaft*, Part 2, pp. 33-37. Hannover, February 1913.

The sheep of the community graze on undivided communal land (natural meadows) and the land of the members of the community (arable ground laid down to pasture meadows). The number of the sheep of each member depends upon the size of his holding. (Ed.).

The number of sheep in South Germany has diminished to an ordinary extent of late years.

This is shown especially clearly by the Bavarian statistics: during to the latter, the number of sheep in Bavaria was:

In 1892	968 414
• 1897	905 916
• 1900	760 428
• 1904	680 099
• 1910	638 321

In June, 1907, the sheep on the different farms were divided as follows:

Large farms of over 250 acres	27 599 head
Average and small farms	743 046 "

The continual subdividing of the communal property, chiefly at the request of the small peasant proprietors, and the consequent reduction of the common flocks, have led to the general decline of the sheep in South Germany. This result has also been furthered by the more intensive cultivation of the land, over-sea competition, and the loss of the market by unfavourable commercial treaties, as well as by the experience of shepherds.

The writer suggests as means of promoting sheep-breeding: more intensive feeding (clover pastures) the reestablishment of courses of instruction for the shepherds, and the retaining of the common lands wherever these are suitable for sheep-breeding.

394 - The Apulian Merino Sheep.

Josa, G. La pecora merina pugliese. — *Estratto dall'Almanacco dell'Italia agricola di Agricoltura per l'anno 1913*, pp. 15 + fig. Piacenza, 1913.

Flocks of Merino sheep were imported into Apulia from Spain probably from the time of Alfonso I of Aragon; by Murat; and repurchased by the Bourbons of Naples. The Apulian Merino sheep of today descended from the flock of the Royal farm "dei tre Santi", which consisted in 1860 over 120 000 head and, after the fall of the Bourbons, was purchased by some of the large Apulian breeders. These sheep are found on almost the whole of the plains of the Capitanata, i. e. the Tavoliere. They are of medium height and their wool is short and fine; they also give meat and milk. The flocks are kept on the nomad system; they graze the Apulian pastures from the end of October to the end of May, and the sheep pastures of the Abruzzo and Molise mountains for four months. The animals obtain all their food from grazing: 16 head to 10 acres in the plains and 12 in the mountains. The lambs, during and after weaning, are fed on barley or vetches. There are few or no shelters.

1000.

average weight of washed fleece *
 on the old 2 1/4 lbs. Teg 1-2 years old 5 3/4 lbs.
 4 to 5 " Ram 7 3/4 "
 maximum length of wool of fleece :
 Absolute : 4 1/2 in. (lambs) to 6 in. (selected rams)
 Relative : 3 1/2 in. (4 year-old ewes) to 5 1/2 in. (selected rams)
 number of curls 15 to 17 per inch.
 medium diameter of fibres 0.0008 to 0.0010 inch.

in operation, the wool loses from 25 to 33 per cent. in weight

eat.

average live weight :
 "vernareccio") born in November : at birth 8 3/4 lbs. : 5 months old, 75 lbs.
 "cordesco") " " February : " " 8 lbs. : 45 days " 30 "
 "mulacchio") " " March : " " 8 " : 30 " " 24 "
 ram 100 lbs. Ewe teg 60 lbs.
 1st run 130 " 2-year-old ewe 75 "
 2nd 3 to 6 years old 160 " Ewe (from 3 to 6 years old) 90 "
 175 "

milk.

production per ewe per day, 1 1/2 to 3/4 pint.
 production per ewe per annum 12 to 16 gall.
 composition of milk : S.G. 1.0375 ; fat 7.55 ; total solids, 19.22 per cent.

profits are most variable, depending chiefly upon the season. The writer kept an account of the expenses for two successive years : with a flock of £10 587 (2 700 sheep at about 18s each ; 1 220 acres of pasture ; 1000 ; circulating capital ; live stock ; utensils and apparatus for shearing) and with £11 249 for expenses (£527 for interest on capital) for the staff, mountain pasturage, etc.), there was in 1909-1910 a gross return of £11 626 and a net return of £ 373 ; in 1910-11 the gross return was £ 1 427 and the net returns £ 178.

Sometimes the expenses sometimes reach 95 per cent. of the gross returns ; sometimes the yield may be regarded as satisfactory.

It has been recommended in order to improve the condition of the flock that the Apulian merinos should be crossed with the Rambouillet in order to obtain early maturity and more mutton. But the hybrid is less productive and apparently produces less milk. The writer therefore prefers the present type and counsels improvements in the rearing (better shelters, less fatigue).

the Merino Sheep of North Africa.

DE MEYER, M. Le Mouton Mérinos dans l'Afrique du Nord. — *La Vie Agricole et Rurale*, 2, No. 7, pp. 207-211. Paris, January 18, 1913.

The writer estimates the number of sheep in North Africa at about 10 million head. Unfortunately bad management, occasional scarcity of

food, entire ignorance of the principles of breeding and other causes have prevented sheep-keeping becoming a success. The are very unequal and the results of sheep-keeping are of small. The extensive and excellent grazing land would permit of an i in the number of flocks. The writer is of opinion that the multi duction could easily be doubled and the wool production quad if the following measures were adopted: regulation of the water (arrangements for damming back the water, multiplication of w places), turfing the ground, making sheds for shelter in bad w cultivating cereals or pulse, careful selection of animals used for ing. The writer considers that of the three breeds of sheep in Africa (the fat-tailed, Berber, and Arab breeds) the latter, w believes to be the original of the Merino, could easily be im. This sheep has a white face; its wool is good, fine, and much. The Arab sheep is a good wool-producer and possesses in a late all the advantages of the present Merino breed; these latent charact would be brought out and increased by mating selected ewes with rams. For this purpose the writer recommends the Rambouillet

396 - A New Method for the Industrial Preservation of Eggs.

DE KACHEL. Conservation industrielle des œufs. — *Revue de Chimie in* Year 24, No. 277, pp. 12-18. Paris, January, 1913.

After rapidly touching upon the subject of the consumption and the different ways in which eggs are used in industry and as of diet, the writer gives a summary of the various processes employ preserving them. As far as his experimental experience goes, he prefers methods based on the use of animal or vegetable fat, and esp those where the eggs are embedded in soft fat in such a way as to e all passage of substances from outside. Before the eggs are coat fat, they should be sterilized with a 0.2 per cent. solution of fluo silver. The material for coating is compounded according to the fol formula :

Earthnut oil	14	gr.
Palm oil	20	"
Coconut oil	16	"
Prepared lard	47	"
Spermaceti	2	"
Trioxymethylene	1	"
Powdered thymol	0.05	"

This mixture prepared over a slow fire acquires, when cold, th sistency of vaseline and is as easy to manipulate. Eggs preserved i way had the same appearance and taste after 18 months as so-called laid eggs". This system is adopted at a small factory near Ghent, about 26 000 000 eggs were preserved last year, the work all being by hand and almost entirely by women. The cost price of sufficient m to coat 100 eggs is not more than 6d, and the preserving cost doe exceed 1s 8d per 100.

Poultry Tick.

D. F. Department of Agriculture of South Australia, Bulletin No. 74. Adelaide, 1912.

poultry tick (*Argas persicus*, super family *Ixodidae*, family *Argasidae*), according to the writer, introduced into South Australia and does much harm in the former country, being the means of transmitting *Spirochaeta Marchouxi* (the causative agent of tick fever). Treatments against tick fever have been obtained with salvarsan, but a radical cure, in the opinion of the writer, is the eradication of the tick. To this end Mr. Laurie has tried various measures and he has found that a 5 or 10 per cent. kerosene emulsion is the best remedy. Ticks are destroyed by one minute's immersion in this liquid; for other purposes, the spraying, and even soaking, of poultry houses with kerosene emulsion has proved efficacious. Old timber containing many holes which serve as shelters to the ticks, should not be used for poultry

paper deals at length with the life-history of the insect and is illustrated with many good plates. It also gives the regulations in force in Australia regarding the diseases of poultry.

Brood, a Disease of Bees.

G. F. in U. S. Department of Agriculture, Bureau of Entomology, Circular No 169. Washington, 1913.

The writer refers to the works of Howard, Maassen, Burri and Kürschner on brood diseases of bees. The last-named investigators found the brood free from bacteria in Switzerland. This disease was carefully studied by the writer, who gave it the name of "Sacrood", the most characteristic colour assumed by the infected larva being a gray decay. Various shades are observed; the term "gray" might be used to describe the colour. The form of larvae which are infested with this disease changes much less than it does in foul brood. The body wall is, as a rule, not easily broken; thus often the larva can be removed intact from the cell. The content of this larva is more or less watery; the head end is usually turned upwards. There is practically no odour from the brood combs. In the investigations of the disease, dead and infected larvae were removed from the combs, crushed, and mixed with sterile water. This mixture was filtered in a Berkefeld filter. The filtrate was fed in syrup to healthy colonies and sacrood with typical symptoms was produced in all the colonies thus fed. Filtrate from the brood of one of the infected colonies, when fed to two healthy ones, produced sacrood in each. Other experiments made indicate that the virus is killed by application of a comparatively small amount of heat. The writer is publishing a detailed account of his investigations.

399 - Tape-Worm Disease of Roach and Bream.

WUNDSCHE, Die Bandwurmkrankheit der Pleizen und Bleie im Müggelsee, ihre Ausbreitung durch den herbstlichen Vogelzug und ihre Bekämpfung. — Mitteilungen des Vereins für die Provinz Brandenburg, Vol. II. (New Series), No. 12, pp. 176-181, March 1913.

An investigation of the waterfowl which frequent the Müggelsee near Berlin has shown that the strap tape-worm (*Ligula simplicior*) which is found sexually immature in roach and bream, occurs in numbers, and with fully developed reproductive organs, in the alimentary canals of Common Gulls (*Larus canus*), Black-headed Gulls (*L. ridibundus*), Goosanders (*Mergus merganser*) and Red-breasted Mergansers (*M. serrator*).

FARM ENGINEERING.

400 - Comparison of Sources of Mechanical Power in Agriculture.

SCHWANECKE, H. K. Vergleich mechanischer Betriebskraft im Landwirtschaft. — Fühlings Landwirtschaftliche Zeitung, Year 62, Part 3, pp. 95-108, Stuttgart 1, 1913.

This paper compares, with the help of diagrams, the most important power machines used in farming, as regards the cost of installing and running them, the space, upkeep and assistance they require, as well as safety and readiness for use.

The total cost of installation of power machines increases with their size, while at the same time the cost of installation per horsepower diminishes; but the different machines vary considerably in this respect. These differences are shown in the annexed diagrams (figs. 1 and 2).

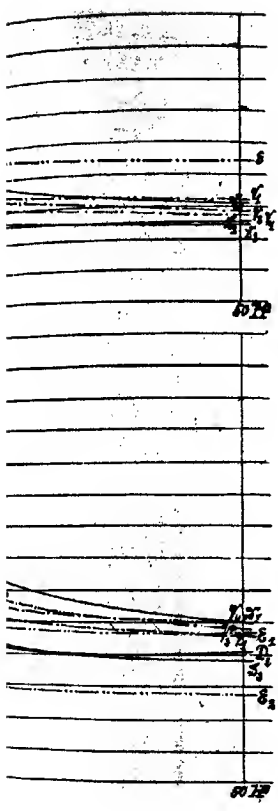
It will be seen that electric motors require the least cost of installation, next follow combustion motors, then steam engines and lastly windmills. Within these main lines there are smaller variations which are clearly shown by the diagrams.

The working expenses include generally interest and amortisation of installation capital, repairs and upkeep of the plant, fuel, lubricants and wages of engine men. To these must be added smaller sums for insurance of the plant and attendants, etc. The interest and amortisation are in the main constant annual expenses, and nearly the same whether the machine works much or little, while the other expenses depend mostly upon the greater or less use of the plant. In figs. 3 and 4 curves show the working expenses for 300 and for 600 hours' work per annum.

As regards the amount of space required, the writer gives the following data: Electric motors require the least space, combustion motors next, after which steam engines fixed and portable, gas motors and

(1) See No. 229, B. May 1912.

(2) The Mark is about 0.98 of a shilling; taking it as shilling, each division represents £100 and in fig. 2 £10. In fig. 3, each division (4 Pt.) represents very nearly one halfpenny.



improved steam engines. Wind motors do not as a rule require space, and local conditions decide as to the advantage of using them. The smallest demands as to upkeep and attendance are made by electric wind motors. Combustion motors follow, after which come gas and then steam engines.

The greatest safety in working and the greatest durability are afforded by electric motors and in general also by wind motors. Somewhat less reliable are the combustion and gas motors, and least of all the steam

as regards the ease and rapidity with which they may be set going, motors occupy the first place, followed, in decreasing order of merit, combustion motors, gas motors and steam engines.

Finally, the writer observes that the choice of the power-machine depends very much upon local conditions and that consequently no particular type of motors may be considered absolutely superior to the others.

New Dynamometer for Steam Ploughs.

Dr. J. Ueber ein neues Dampfzug-Dynamometer. — *Mitteilungen der landwirtschaftlichen Lehranstalt der k. k. Hochschule für Bodenkultur*, Vol. 1, Part 3, pp. 393-406. Vienna, January 15, 1913.

The writer draws attention first to the great difficulties which attend technical investigations on the double engine system of ploughing, measuring the indicated power and that effectively transmitted from the engine to the plough, and then to the unreliable character of the instruments and methods hitherto employed for this object.

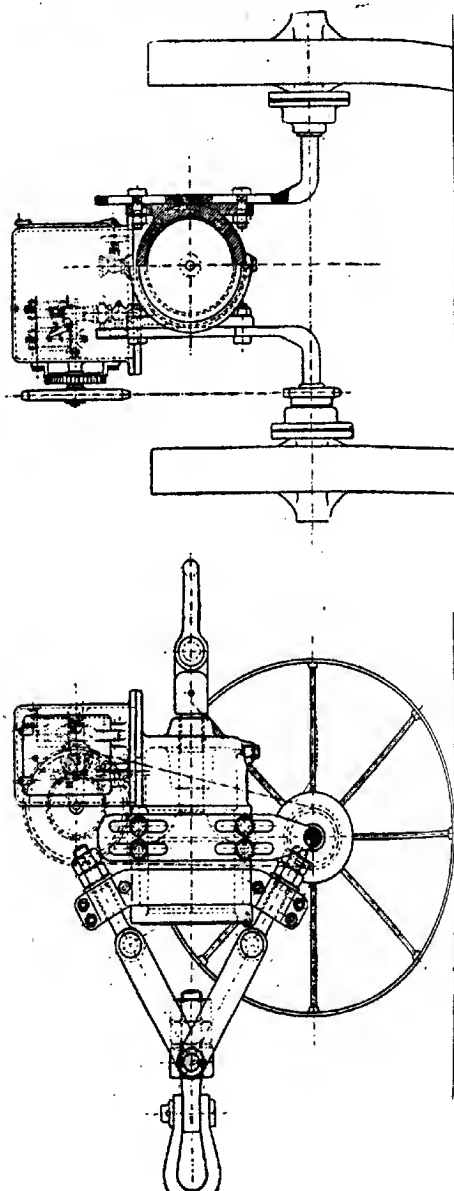
After an exhaustive review of the existing dynamometers, the writer describes the solid and durable apparatus he has invented (figs. 1 and 2) for perfect and reliable working.

This belongs to the group of cylinder and piston instruments. Its cylinder, filled with glycerine, is connected with the draught hook of the plough and the piston with the cable of the working engine. The pressure on the liquid is registered by an indicator, shown in the drawing, a strip of paper fastened to a drum which is caused to revolve in the same direction by a belt from the axle of the bearing wheels.

This cylinder and piston instrument has the advantage over spring dynamometers in having a rigid non-elastic connection between the motor and the working implement, thus in no way altering the manifestations of the work to be examined. It can besides be built of the necessary dimensions to ensure the required solidity and durability of the instrument, which is not possible with Prof. Giordano's box dynamometer (1), the principle of which requires the sides to be as thin as possible. A further advantage of all cylinder and piston instruments lies in the possibility of comparing them with steam engine indicators.

While in box dynamometers the deformation of the box is constant, in cylinder and piston instruments there is a cause of error in the friction

See: GIORDANO FEDERICO. *Le ricerche sperimentali di meccanica agraria*, p. 132. Milano. (Author's note).

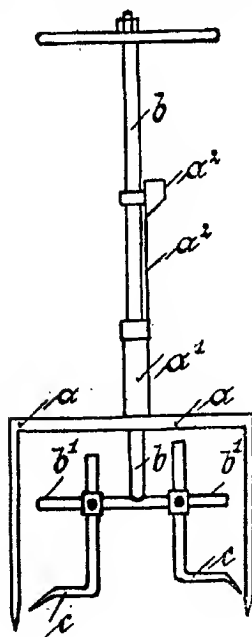


piston in the cylinder, and this has been avoided by the writer in the apparatus by the use of a frictionless piston so arranged as to revolve in the cylinder. A special device to cause it to revolve is not necessary. The dynamometer is used in investigations of steam hauled ploughs, and it is so situated between the plough and the engine that the cable is connected with the piston instead of with the cylinder. When this condition is fulfilled, the cable, owing to the twist it gets in the making, gives the piston a rotary motion in the cylinder, which begins immediately the cable is taut and continues regularly in the same direction for the whole length of the furrow. The piston moves in the cylinder almost uniformly along to a helicoid line, the pitch of which, though amounting only to a small fraction of a millimeter, is strictly proportional to the changes in resistance to traction, because the constant rotary motion of the piston prevents any friction arising.

Hand Hoe for Beets.

Handhacken zur Rüben-Kultur. — *Blätter für Zuckerrübenbau*, Year XX, No. 3, 1913. Berlin, February 15, 1913.

By means of the hoe shown in the annexed figure it is possible to work in a circle all round a beet without damaging it. The implement



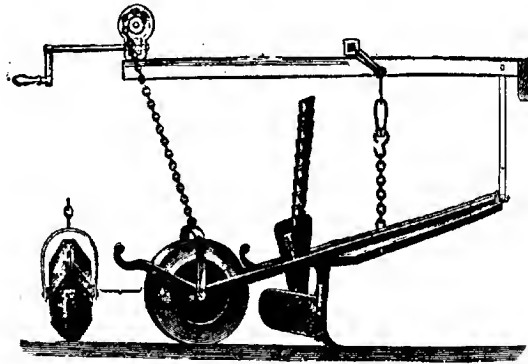
consists of two blades (*c, c*) fixed at variable distances on the horizontal arms (*b' b'*) of the vertical handle (*b*), which goes through a socket in the fork (*a*). The socket is provided with a rod (*a'*) which is used to push the fork into the ground. By shifting the position of the blades *c* differing in shape, size and distance apart may be conveniently had.

When the tool is placed over a plant and the cross-handle is turned, the blades, pointing in or out according as they have been set, loose ground in a circle all round.

403 - The Praeger Drill.

VOGLINO, E. Il metodo Demtschinsky si può applicare anche ai cereali di primavera — *Il Coltivatore*, Year 59, No. 3, pp. 73-79 + 5 figs. Casalmonferrato, January 30.

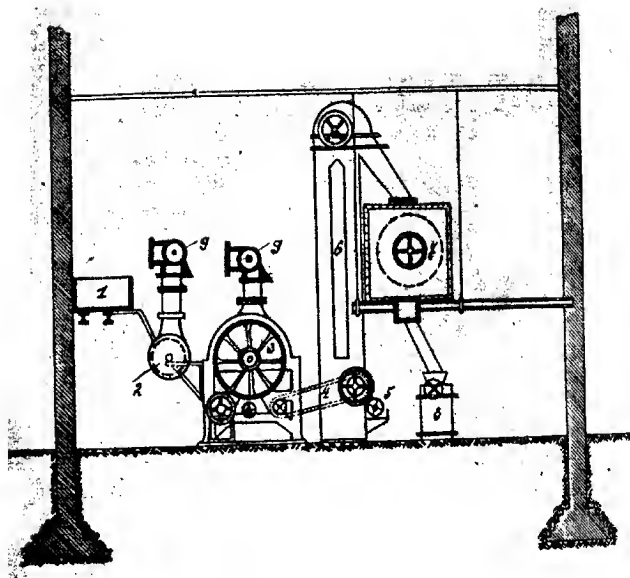
The writer, in discussing the Demtschinsky method (1) modifies Zehetmayr for the cultivation of wheat and of other cereals, mentions a new drill suitable for opening the small furrows in which the seed is mainly covered by a layer of slightly compressed earth as is required by



above method. This drill, invented by Zehetmayr, is built by Praeger Raudniz on Elbe (Austria), after whom it is named.

The writer has seen this drill at work in Apulia in the estate of S. dei Normanni belonging to Prince L. di Frasso-Dentice, who used it in his estates in Moravia and suggested to the maker some improvements especially regarding the distance between the furrows, which he would be eight inches and upwards so as to allow of horse-hoeing.

(1) See No. 1708, B. June 1911.



The writer says that the drill in question is an ingeniously contrived mechanical machine which resolves very well the problem of sowing in s. A small share is attached directly to the seed distributing tube (1) and is followed by a wheel-shaped roller, which, besides compressing the earth about the seeds, which is so useful in dry soils, assists in giving the furrows a proper shape, thus rendering them less liable to be damaged by rain and bad weather. With these drills sowing as with the usual drills can be carried out and they be fitted with the usual coulters.

The Present State of Milk-Drying Technique.

From, *EMIL*. Der heutige Stand der Milchtrocknungstechnik. — *Monatshefte für Landwirtschaft*, Year 6, Part 1, pp. 16-29. Vienna, January, 1913. Under the name "Milk-powder" the writer designates the powdery substance into which whole or skimmed milk can be transformed. It contains only 12 to 14 per cent. of water; otherwise its chemical composition is the same as those of milk. It appears to dissolve in water without leaving any residue and the solution possesses all the characters of fresh milk.

A great proportion of the methods known for the preparation of milk powder have found but little practical application; such, for instance, are the processes of the Rhine Food Industry company, Berlin, of the chemical works "Rhenania" of Aix-la-Chapelle, of Dr. Knoch, Stuttgart, Kipfer and Müller, of John Carnrick of New York and Robert Ellin, Vonkers A), of the soup tabloid manufacturers, I. Maggi, etc. Dr. Eckenberg's method process raised much interest but has not been adopted to any great extent.

The process according to Just Hatmaker's patent is widely spread in Holland and in France, Germany and neighbouring countries.

Dr. Knoch has observed in milk powders made by this method that the powder loses the power of dissolving and that the fat separates on the surface of the liquid.

A process that has recently appeared is that of the Dry Milk Central (Trockenmilchzentrale) Oskar Nicolai, Viersen, Rhineland. The method of proceeding is the following: Well filtered milk is reduced in a preliminary evaporator to a certain volume, after which it passes to the milk drying machine, which in the main consists of a small distributing roller and a large steam-heated drum; by means of a scraper-like device the thin sheet of milk as thick as paper is detached from the drum and laid on a carrier which conveys it to a screw which breaks up the sheet and carries it to an elevator, whence another screw delivers it to an automatic drying apparatus. On leaving this it goes through a screening machine fitted with brushes and sieves from which it issues ready for packing and for sale.

A milk drying plant on this system is shown in the annexed figure, in which 1, is the milk tank; 2, preliminary evaporator; 3, drying drum;

4, carrier; 5, transport screw; 6, elevator; 7, drying apparatus; 8, screening machine; 9, ventilators.

Similar to Nicolai's process is Gabler Saliter's. The drying, however, is not performed by a current of air but in a vacuum apparatus.

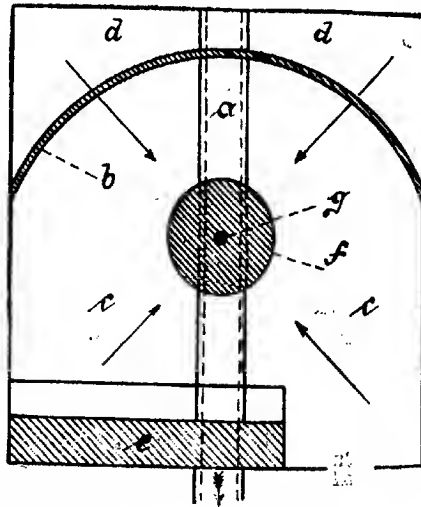
Lastly the Trufood process is to be mentioned; according to the milk is first concentrated in vacuo and then submitted to the pulping process.

From the above it appears that quite a number of methods for preparation of milk powder are known. Whether these yield a product which may be pronounced perfect from every point of view is an open question. Anyhow some of the processes produce fairly satisfactory powders.

495 - A Practical Flooring for Pig Styes.

LEHNI-GISLER, H. Ein praktischer Schweinestallboden. — *Schweizerische Landwirtschaftliche Zeitschrift*, Year XLII, Part 6, pp. 131-132. Zürich, February 7, 1913.

The basin-shaped floor shown in the annexed figure is 9 ft. 9 in. square with a fall in the centre of about 5 inches. A covered drain (d) crosses throughout its length. An approximately semicircular concrete or brick



rim (b) 4 inches wide and 6 in. high, divides the floor into the part for litter (c) and the part for the droppings (a). It has been observed that pigs prefer leaving their droppings along the wall furthest from the trough where the floor is somewhat higher. This fact has been considered in the arrangements of the present floor. The urine follows the outside of

falls into the drain without wetting the straw. Another advantage of the straw, through the movement of the pigs, tends to collect the wet part just where the animals like to lie; consequently they rest on the straw instead of on the bare floor.

Each brood sow has a wooden disk about 28 inches in diameter (f) is fastened to a post (g) reaching down from the roof to 12 inches above the lowest part of the floor. Under this disk the suckling pigs can crawl and avoid being pushed by their mother.

RURAL ECONOMICS.

On the Limit Value of the Means of Agricultural Production as Basis for the Calculation of the Economical Limit of Outlay.

von LEO. Der Grenzwert der landwirtschaftlichen Produktionsmittel als Grundlage der Berechnung der ökonomischen Intensitätsgrenze des Aufwandes. — *Mitteilungen landwirtschaftlichen Lehranstalten der k. k. Hochschule für Bodenkultur in Wien*, Vol. I, 3, pp. 411-441. Vienna, January 15, 1913.

different portions of the means of production employed have the same value for agricultural production, for each of them, though equal among themselves, is utilized to a different degree. After reaching an optimum production the gross returns, and consequently the net returns, for the same additional outlay begin to diminish, and production at last reaches a point at which the total gross return does not increase any more by any further addition of outlay. The order in the utilization of the portions of outlay follows the well-known law of diminishing returns of agricultural production, which is determined by the following facts:

1. The production of plants on a given area is limited by the following factors which are limited to the unity of surface: space, light and air, and rainfall; animal production in its turn is limited by the physical dimensions and specific productivity of the organisms.
2. According to Aereboe the character of being present in the minor proportion may belong at any moment to any one of the factors; the better or worse utilization of an outlay the frequent favourable chance of all the necessary factors of production is decisive. The moments however in which plants are in a position to utilize fully a considerable capital of plant food in the soil must be all the more the higher this capital is, the more the requirements of plants vary in amount and quality of their plant-food during their period of growth and the shorter the latter is.
3. The first portions of the outlay serve to build up and to maintain the substratum of production in the organism of the plant or of the animal. By the subsequent portions of outlay are utilized for transformation into the principal products.

The writer gives a graph of the relationship between the quantities of production employed, the limit gross returns, and the total

gross returns. The "limit gross return" of the total outlay is the increase of the gross return obtained by the addition of the last portion of outlay. It is to be distinguished from the real gross returns obtained by the portions of the outlay: while the "limit gross return" in general is the same for every portion of the outlay, the real gross returns, or the average gross returns or the portions of general gross returns corresponding to each portion of any outlay, are equal to each other. The "limit gross returns" are used when it is a question of expending or not expending the last portion of an outlay; while the average gross returns serve for the calculation of average utilizations and the like. The writer then gives a mathematical formula showing the relation between the two values, and demonstrates further that the total gross returns may be expressed either as a product of the average gross returns by the number of portions of the outlay, or as the sum of the limit gross returns.

After having introduced the notion of "limit gross returns in cash", he arrives, with the help of integral and differential calculus and on the basis of limit gross returns, to a mathematical expression for the total gross returns for a given outlay. He thus shows that the gross returns may be considered as a function of the outlay.

Under "utilization value" (Gebrauchswert) of a means of production, only the cash net returns value is to be understood. This is obtained by subtracting from the increase of the cash gross returns the cost of the greater quantity of means of production used or of the further increase of costs of production. It is an error to designate the utilization or the gross returns as the "utilization value" of a means of production. High gross returns and a higher utilization lead to a utilization value of a means of production only when there are net returns. These however depend to a great extent upon the cost of producing the means of production.

Nor can any money value determined indirectly for any non-material means of production be called utilization value. From the above it appears that the cash net returns value of a certain quantity of means of production may be directly calculated with correctness by a variation experiment only when the variation is possible without alteration of other factors which take part in the production. The correct calculation of the cash net returns value of such quantities of means of production without which there cannot be any production, for instance the total quantity of meadow hay supplied as principal food, is theoretically quite impossible of the question, as in this case every experiment of variation on the quantity is impossible. In order to ascertain the limit of intensity of the cash net returns value of those portions which are near the supply limit of intensity need be calculated. The writer then explains the meaning of the "limit cash net returns value" (grenz-geldreinertragswert) briefly "limit value", which represents the increase of the cash net return obtained by the last portion of the outlay, and he calculates this also on the basis of the "limit gross returns."

The limit of intensity can be rigorously established in figures only when the means of production the cost of producing which is known. This is

se with those unmarketable means of production used as the basis of
tion. With concentrated foods and chemical manures the precise
of intensity stated in figures plays an important part. The use of a
of production for agricultural produce has reached the economical
at intensity when it attains that point at which the cash net returns
a maximum. In order that this should be the case all those portions
still have a positive limit value must have been employed; at the limit
ensity there is the one whose limit value = 0. When therefore it can
ertained at what stage of the outlay this portion is situated, the
f intensity will be given. This stage of the outlay is then calculated
writer by means of the cash gross returns and cash net returns values
portions of outlay, and in this way he finds a formula for the exact
ation of the economical limit of intensity of the outlay.
astly, he determines by means of an experiment of Schneidewind
nuring sugar beets with nitrate of soda, and one of Kellner on milk
as affected by increasing quantities of fodder, the limits of intensity
outlay on manures and on concentrated foods respectively, as they
from these variation experiments.

The Profitableness of Hoed Crops.

awz, B. Die Rentabilität des Hackfruchtbaues. — *Fühlings Landwirtschaftliche*
wg, Year 62, Part 4, pp. 113-128. Stuttgart, February 15, 1913.

he writer endeavours to show in this paper that it is possible by means
inductive statistical method to find the most suitable organization
gree of intensity for the most varied conditions. In order to cal-
the intensity of labour in the farm he values the percentage of the
e devoted to meadows and forage plants at $\frac{1}{2}$, that taken up by
crops at 1, and that occupied by hoed crops, which are the most
ng, at 3. In this manner he obtains a figure which represents the
ity of cultivation (Anbau-intensitäts-zahl) characterizing a farm (1).
culated this index number for all the farms he examined, then he
ed the farms according to these indices and observed the results of
rms in connexion with this order. The material for this work was
from the book-keeping records of the German Agricultural Association
che Landwirtschaftsgesellschaft) and the Book-keeping Bureau of
nber of Agriculture of the Province of Silesia. Only those farms
considered in which conditions allowed of a reduction or increase of
ea devoted to hoed crops.

superficial observation of the farms arranged according to the above
shows what far-reaching differences are caused by altered intensity
ivation (see Table I).

If for instance 25 per cent. of the total acreage is devoted to meadow and forage
5 per cent. to grain and 50 per cent. to hoed crops, the index number of the
of cultivation will be $25 \times \frac{1}{2} + 25 \times 1 + 50 \times 3 = 187.5$.

TABLE I.

Number of farms	Index of intensity of cultivation	Total value per acre	Net returns per acre	Gross returns per acre	Interest per cent	Gross returns in percent of value
		£ s d	£ s d	£ s d		
Extensive 40	103	28 3 5	15 7 4	3 4	2.76	14.8
Medium 37	122	28 19 3	1 7 1	5 7 6	4.65	18.5
Intensive 40	141	34 6 5	1 13 9	6 10 11	4.91	19.1

According to the above, the greater economical utility of food over forage crops in regions in which arable land predominates can be doubted, for with extensive farming (much land under forage crop meadows) the gross returns are £2 7s 7d per acre less than with intensive farming. That these results are not to be attributed to the better conditions of the growth of plants, but chiefly to the increase of intensity, is shown by the figures of the last column but one: £100 worth of property yield extensive farming only £ 14.8 gross returns, while with medium intensity these reach £ 18.5, and even with an increasing value of property greater gross returns (19.1 per cent.) have been obtained.

The greater intensity of farming brings also a considerable advance from the point of view of private economy.

The group of farms under extensive culture bears a quite inadequate interest on the capital engaged, namely 2.76 per cent., while the intensive group yields upwards of 4 per cent., and the most intensive at least 5 per cent. But the farmer requires also interest on his working capital at least 6 per cent.

TABLE II.

Group	Outlay per acre	4 per cent interest on value per acre	6 per cent interest on outlay per acre	Total	Net returns per acre
	£ s d	£ s d	s d	£ s d	£ s d
Extensive	3 15 9	1 2 7	4 7	1 7 2	15 7
Medium	4 10 1	1 3 2	5 5	1 8 7	1 7 1
Intensive	5 13 11	1 7 6	6 10	1 14 4	1 13 9

The returns of extensively cultivated farms (see Table II) reach little over one half of the interest required, in the medium group

far from it, while in the most intensively farmed groups an almost equal interest is attained. To this it might be objected that these results are due to the fact that the properties of the extensively cultivated farms are valued too high in comparison to those of the other groups. The writer maintains that he is justified in believing that the valuation of the farms in the groups is correct, when the average result of large averages in the groups is the same. In order to show that such is the case with the series under discussion, he distributed the farms independently of the previous grouping into three groups according to the height of their net returns taken as a basis for the land-tax (Grundsteuer-Reinertrages): a) low, b) medium, c) high net returns as basis for land-tax (see Table III).

TABLE III.

	Net returns basis for land tax	Number of farms	Total value per acre	Net returns per acre	Interest per cent
	s d		£ s d	£ s d	
.....	3 11	31	20 12 8	17 1	4.14
.....	7 2	34	28 19 3	1 5 9	4.28
.....	12 9	32	40 1 5	1 12 3	4.02

The range of interest, 0.26 per cent., is so small that it may be completely neglected. A further proof of the reliable nature of the results is the ratio of net returns to gross returns: in the extensive farms the net returns are less than the fifth part of the gross returns, while with increasing intensity they become more than a quarter of the latter (Table I). The writer has also tried to test the trustworthiness of the results by checking the figures according to the rule of probabilities. He then divides the 117 farms into progressive groups by collecting the farms in the first group and then successively removing the first farm from the list and adding the one on the list following the last one of the group; he obtains a series of 77 groups each of which represents the averages of the farms, the first being the group of most extensive farming and the last the most intensive — Mitscherlich's method. This table also, which shows the progress of development not influenced by arbitrary division into groups, confirms the correctness of the results by the regularity with which interest and gross returns increase with the intensity of cultivation. In order to make sure that the results can be generalized, the writer has selected from the same point of view the farms connected with the Bookings Bureau of the Chamber of Agriculture of the Province of Silesia for 1908 and 1910-11. Here also the same facts are observed. The most intensively cultivated farms yield 4.88 per cent interest, which is 2.30 per cent more than that of the extensively cultivated farms. The writer

therefore considers that it is not advantageous to organize on lines where intensive culture would be suitable.

A second question arises: Does an intensification of culture in sive organization promise success? (1).

In order to answer this question a table is given (Table IV) the interest yielded by averages of 117 farms, divided within the groups of degree of intensity also according to the amount of outlay

TABLE IV.

	Extensive cultivation			Medium intensive			Intensive cult	
	Gross returns per acre	Interest per cent.	Outlay per acre	Gross returns per acre	Interest per cent.	Outlay per acre	Gross returns per acre	Interest per cent.
	£ s d		£ s d	£ s d		£ s d	£ s d	
Low outlay . . .	2 18 9	3.98	2 16 0	4 12 6	5.86	3 6 3	5 0 5	6.10
Medium	4 1 9	2.38	3 16 7	4 15 8	3.74	4 2 11	5 16 3	4.40
High	5 11 11	2.10	5 13 6	6 8 7	4.90	6 2 7	8 7 0	4.95

Only those extensively cultivated farms which limited their show a satisfactory rate of interest approaching 4 per cent., while an increase of the outlay the profits diminish considerably. This increasing expenses is in nowise observed in the more intensively cultivated groups, though here also the farms with the smallest outlays are most profitable. From the above it is also seen that it is not a question of high gross returns in themselves, but of high gross returns together with the lowest expenses.

In the group of extensively cultivated farms those with a low outlay show in comparison to their gross returns high net returns, which are almost satisfactory rate of interest. But the gross return as a percentage of their value are strikingly low. From the point of view of public economy, these farms perform their duty only very imperfectly. When they attempt to do this better by increasing their expenses their profitability suffers (see Table V).

(1) German economists call intensive culture in extensive organization, the employment of much capital and labour on the crops cultivated; but crops are chosen, which absolutely, require but little capital and labour, as for instance: meadows, hay and cereals.

TABLE V.

	Extensive		Medium		Intensive	
	Net returns per cent. of gross returns	Gross returns per cent. of value	Net returns per cent. of gross returns	Gross returns per cent. of value	Net returns per cent. of gross returns	Gross returns per cent. of value
1.	33.5	11.9	30.9	18.9	34.9	17.5
2.	14.6	16.3	19.5	19.2	22.5	19.5
3.	13.2	15.9	25.9	18.9	22.9	19.8

the extensively cultivated farms are grouped on Mitscherlich's according to increasing expenses, the rate of interest sinks at once, 3.97 per cent. descends to 1.99 per cent. The capability of the crops with extensive organization can therefore only be limited in order to afford a further proof for this statement a measurement of total intensity has been made in the three groups of different intensification by means of a score in which from one to three points are given to each of the following: Intensity of cultivation, amount of labour, amount of live stock and amount of dead stock. Table VI shows the interest obtained for the various groups.

TABLE VI.

	Low total intensity	Medium total intensity	High total intensity
	per cent.	per cent.	per cent.
extensive cultivation	4.27	3.64	2.46
medium intensive cultivation	3.53	4.44	2.99
intensive cultivation	3.96	6.15	5.24

In the above it is seen that extensive cultivation allows only of a low total intensity, that also with medium intensive cultivation the total intensity is possible and suitable only to a certain degree, in the case the farms with the highest total intensity yield the insufficient interest of 2.99 per cent., and that only the intensive group affords the best play room for the increase of intensity. The motto "Extensification with intensive cultivation" is only justified in the sense that on a farm the intensity may be diminished by laying down pastures and amount of labour and money thus left free be applied to the fields for the purpose of more intensive working, etc. Forage crops and meadows,

even with the most careful farming, do not allow of such an intensification as hoed crops. The more suitable intensive cultivation is from an economical point of view, the less may the organization be extended.

The writer next raises the question whether from the above conclusions may be drawn respecting the most advantageous intensity of cultivation according to the kind of soil. In order to answer this, he arranged the farms in the three groups of different degree of intensity according to the net returns taken as basis for the land tax (Grundsteuerertrag) and according to their total value. The results are shown in Table VII.

TABLE VII.

	Extensively cultivated farms. Interest per cent.	Medium intensively cultivated farms. Interest per cent.	Intensive cultivation. Interest per cent.
Low net returns taken as basis for land tax	2.52	4.91	4.91
Medium d. ^o	2.90	4.48	5.38
High d. ^o	1.59	5.38	4.91
Low value	3.65	5.06	5.38
High d. ^o	2.27	4.57	4.91

From the above it is seen that the farms with high net returns taken as basis for the land tax or with a high total value combined with extensive organization yield a remarkably low rate of interest: 1.59 to 2.52 per cent. Consequently the better the soil the less promise of success is shown out by extensive organization.

The writer observes that the increase of live stock is no reason for the limitation of hoed crops, as every sugar beet farm where the cultivation of beets is economically advisable, is practically equal to a forage farm for the feeding of cattle, owing to the abundant masses of forage afforded by the beet residues.

In order to test the effect of the increase of intensity upon poor, old and good soils, the farms, in groups according to the intensity of cultivation, are arranged on Mitscherlich's method and show that both on poor and on medium soils the cultivation of plants usual to a more intensive cultivation affords a better interest on the capital employed: 3.70 to 5.05 per cent., and 2.44 to 4.61 per cent. The development in farms with the best soils takes the form of a curve in the following direction: 4.22—5.05—5.16—4.91—4.67. Here the optimum of intensiveness has probably been passed towards the end of the curve.

In conclusion the writer emphasizes the fact that the superiority of hoed crops, in so far as they are represented by sugar beets, appears

agree only owing to the present prices of sugar, and that with the rise it is liable to diminish. On the other hand, the increase in the value of labour will probably be neutralized in the future by a relatively small rise in the prices of agricultural produce such as cereals and live

Three Years' Returns of the Cooperative Association's Pasture at Kleinmühlingen in Anhalt.

1. Dreijährige Ergebnisse der Genossenschaftsweide Kleinmühlingen in Anhalt.—*Landwirtschaftliche Umschau*, Year 5, No. 7, pp. 133-135. Magdeburg, February 14, 1913.

Grazing Cooperative Association of Kleinmühlingen, which was founded in 1909, rented 29 acres at £3 3s. 6d. per acre as pasture for cattle.

The pasture was divided into three almost equal divisions surrounded by wire fence and provided with a wooden shelter and drinking-troughs. The cost of making the pasture, etc., was as follows:

	£.	s.	d.
making the pasture and compensation for existing crops.	14	4	2½
seed	35	10	5
chemical fertilizers	22	1	3½
draining	65	14	4½
water	22	15	9½
drinking-troughs	—	13	3
ages of artisans	5	11	—
ages of other persons	10	7	8

Total cost . . . 176 18 —

The pasture was used on May 6, 1910, after a crop of grass worth £100 had been taken from one enclosure.

On April 25, 1911, and on April 23, 1912, 1.6 head per acre of young cattle with a live-weight of from 245 lbs. to 267 lbs. per acre, were grazed.

The pasture in 1910 furnished 7000 grazing days, or 238 grazing days per acre; in 1911, a year of scarcity, only 5430, or 185 grazing days per acre; in 1912, 7310 or 248 grazing days per acre.

The expenses of the three years work out as follows.

Years' Expenses	1910			1911			1912		
	£.	s.	d.	£.	s.	d.	£.	s.	d.
Seed	93	2	0	93	2	0	93	2	0
Chemical fertilizers	24	10	0	30	17	5	24	10	0
Amortization of capital expended (10 % of 18s.)	17	12	9½	17	12	9½	17	12	9½
Interest paid	7	1	1½	6	7	5	5	14	8
Draining	2	14	10½	5	14	10½	3	13	6
Total outlay . . .	£145	0	9½	£153	14	6	£144	12	11½
Cost of a day's grazing (allowing for the crop of 1910) was thus . .	3.3d			6.69d			4.71d		

409 - Native Labour in Tunis.

CHENEVARD, W. La main-d'œuvre agricole indigène en Tunisie. — *La M. Colons de l'Afrique du Nord*, Year II, No. 7, pp. 103-106. Algiers, February 1913.

The number of native agricultural labourers in Tunis is estimated at 220 000. If the native remains a whole year on the same farm, he receives a monthly wage of from 32s to 44s according to the district and age. The day's wage, at ordinary times, is from 1s 1½d to 1s 3d; at harvest, it rises to 2s or 2s 2d. On the estates of the native proprietors, the native labourer receives, in addition to his keep, a wage of about £8 to £12. Very varied contracts are made between employer and labourer according as the latter is employed as shepherd, cowman, in the cultivation of cereals, or in growing fruit, this being olives. A shepherd is usually entrusted with a flock of from 150 sheep and goats; in the spring, the owner provides him with a tent. The shepherd's wages are about one tenth of the animals about £2 worth of clothing and 6 to 8 cwt. of barley and wheat, responsible for all losses which he cannot prove to be due to circumstances beyond his control. The wages of the cattleman are calculated according to the number of animals over one year of age and reach per annum, according to the size of the herd and the custom of the district, from 1s 6d to 6s 6d.

In the so-called *Khamessa* Contract the labourer (Khamess) over from the landowner 20 to 35 acres, according to the fertility of the land, for growing corn. The landowner allows the labourer the use of a pair of oxen, a plough, and the necessary seed-corn, and provides him with all that is required for the support of himself and his family. As the labourer receives the fourth or fifth part of the harvest. It is to reckon the annual earnings of such a man, especially if the terms of the contract permit him during his spare time to work on a neighbouring estate. The writer estimates his annual wages at £16 to £20.

The European colonist sometimes gives the native labourer the seed-corn and a helper only at harvest time, so that the latter provides his team and plough, or he gives him a small sum of money in addition to everything which is necessary for his work. The labourer now more generally claims half the crop as his share. It is rare for a proprietor to pay by the piece, for in this case the quality of the work is not guaranteed.

The work contracts affecting the cultivation of vegetables in irrigated districts are also very various. If the labourer is given the animals necessary for drawing water and a small sum of money in addition, he bears all the working expenses and receives, as part of his wages, half the net yield. If the labourer does not enjoy the first advantages, the landowner has to pay for the hoeing and only receives half of the gross yield. If the owner is able to supervise the market, it is advisable to provide the native with better seed, a complete set of tools and the requisite manure, because the net gain for a capital of £120 thus laid out, amounts to about £60 to £70.

the case of the so-called *Mgharsa* Contract, the owner gives the labourer a piece of uncultivated ground on condition that he clears it of stones and weeds and plants it with a specified kind of fruit-tree (olive, fig, etc.). The labourer receives as wages, when the trees begin to bear, half the fruit crop. If the owner does not wish to appropriate his share, he can make a further contract with the labourer (*Moucakate*), under which the latter undertakes the further care of the plantation and receives for this two-thirds of the whole crop. If the ground also bears other crops, the labourer receives four-fifths of the produce.

Agricultural Book-keeping in Austria.

Ergebnisse des Zentralkomitees zur Verbreitung der Buchstellenergebnisse. — *Oesterreichische Agrar-Zeitung*, Year IV, No. 6, p. 65. Vienna, February 8, 1912. •
 Straß, A. Wie sollen die Mittel zur Erhaltung der Buchstellen aufgebracht werden? pp. 61-63.

Agricultural book-keeping bureaux are at present in operation in the different parts of Austria: Lower Austria, Upper Austria, Styria, Salzburg, Tyrol, also in the district under both sections of the Ministry of Agriculture (Landeskulturrat) for Bohemia and Moravia (the bureaux in the German section are in course of being established), in the Bohemian portions of Silesia, and in Cracow, Lemberg and in the Bukowina. The work of the book-keeping bureaux consists in the accurate keeping of the books for 1200 estates of different size.

The "Zentralkomitee zur Verarbeitung der Buchstellenergebnisse" is a bureau which has hitherto only been occupied with establishing new book-keeping bureaux, and working out uniform regulations for the intercourse between these offices and the farms connected with them, will now turn its attention to working up the data which have been observed in the case of the different estates, their total profitability and the results of production, and will consider them under the heads of: Crop and their natural spheres of production; the economic position of the farm and its relations to factories; the mutual relations of the different portions, i.e. whether the various portions are contiguous or scattered; further the chief source of income (cattle breeding or agriculture), the principal crops grown (cereals, roots, fodder, meadow, etc.), the intensity of the cultivation, the technico-commercial side of the farming and other important points of view.

In this way, it will be possible to bring single cases into their proper connection with the whole, and at the same time to obtain an accurate picture of the condition of agriculture throughout Austria.

The principal aim and the *sine qua non* of the success of an agricultural book-keeping bureau is not only to keep correct accounts of every event taking place in the farm, but above all, the power of drawing correct conclusions from the books which enables it to give advice to the farmers so that they can avoid insuccess and obtain the greatest possible return from the property under the circumstances.

The 119 members of the Book-keeping Bureau of the German section of the Moravian Landeskulturat send to the bureaus every week a detailed report of all the events of the farm. Three persons are employed in registering and entering these reports.

One person is entrusted with the whole correspondence of the Bureau. Two close the accounts and balance the ledgers, while one works up the statistics of all the farms from a politico-commercial standpoint. The last-mentioned, but most important person, is the Head of the Bureau, who after the accounts have been done and the balances struck, ascertains the cost of production and draws up the final reports in which the written economic advice is given; he further also visits the different farms and thus keeps in personal touch with the proprietors. The necessary funds for carrying on such a Book-keeping Bureau amount according to the estimate for 1913, to £392 18s.

This sum is apportioned in the following manner:

	£	s	d
1. Salaries of officials and assistants	254	13	6
2. Cost of actual necessities and of publication	109	16	4
3. Cost of establishing courses of instruction	28	6	2
Total	392	18	0

These expenses are covered by:

	£	s	d
1. A grant from the Ministry of Agriculture of	83	5	2
2. The local grant of	31	4	5
3. Members' contributions	20	19	7
4. Shares of the State and local grants	257	8	10
Total	392	18	0

The German section of the Moravian Landeskulturat devotes to the support of its Book-keeping Bureau 3.5 per cent. of all the support which it receives from the State and the local authorities; and the Minister of Agriculture has recognized the right of using a part of the grants for the maintenance of Book-keeping Bureaus.

In the opinion of the writer, it would be a mistake to offer to the proprietors compensation for the expenses incurred in making the weekly reports, the small trouble entailed by these weekly reports should be fully compensated by a conviction of the great value of accurate book-keeping and by the calculation of the cost of production.

AGRICULTURAL INDUSTRIES.

Extract from the Report of the Swiss Dairy Institute in Berne for the Year 1911.

1. Aus dem Tätigkeitsbericht der Schweizerischen milchwirtschaftlichen Anstalt für 1913. — *Landwirtschaftliches Jahrbuch der Schweiz* 1912, pp. 469-492. 1912.

Studies on cheese-making. — Investigations of the curdling process show that, when the time of coagulation is short, the amount of para-produced is more than when it is prolonged. The writer now asks the question whether the production could be increased, without injury to the quality of the cheese, by reducing the coagulation time. Experiments made in order to find an answer to this query prove that the amount of cheese can be increased 0.3 to 0.4 per cent without injury to the quality of the cheese, if the separation time is reduced by one-third. The writer therefore concludes, that in cases where a firm curd is required, this can be attained by shortening the curdling time.

Determination of the solids in milk. — As the direct determination of the solids in milk is not effected everywhere in the same manner, Dr. Burri made experiments to ascertain which of the methods produced the best results. These latter were attained by the gravimetric method, which consists in heating 5 cc. of milk in a flat dish in an ordinary desiccator at 100° C. until it reaches a constant weight.

I. The effect produced upon the Schardinger reaction by the cooling of milk. — Several investigators have maintained that the Schardinger reaction adheres to the fat globules. The writer says that, if such is the case, the fact of the fat of the globules in the milk being solid, or in liquid condition, is possibly not without effect on the enzyme reaction. This supposition has proved entirely correct as is shown by the following summary of the experimental results.

The Schardinger reaction is carried out with fresh milk which has been cooled for one hour to at least 10° C., discoloration occurs 10 minutes sooner than in the case of the same, but uncooled, milk. Cooling down to freezing point produces no further difference. The discoloration in milk which is cooled for an hour is detected by the rapid change of colour on carrying out the Schardinger reaction, and can be partially removed if the milk is again heated to about 45° C. immediately on the conclusion of the cooling period. The condition is stable, however, if two hours are allowed to elapse (reckoned from the beginning of the cooling), before the milk is again heated.

II. Experiments in the reducing effect of cows' milk. — The writer finds that the actual reduction process is hindered, not only by molecular oxygen above, but also by that present in the reagent; that on heating milk, reducing substances are produced, which

under some circumstances counterfeit others which are absent. In conclusion he states that when milk containing many bacteria and which has been heated is used, the Scharding reaction at 45° to 50° C gives no conclusive evidence as to the amount of enzyme present, for its red effect is masked by bacterial activities in the same direction.

412 - The Alpine Dairy Industry.

Milchwirtschaft auf den Alpen. — *Alpwirtschaftliche Monatsblätter*, Year 47, pp. 40-51. Solothurn, February 15, 1913.

A. *Milk yield.* — During the last ten years, the keeping of milk has on the whole declined on the Alps, although the number of cattle there has increased. Thus in 1864, there were in Obwalden, 4 alps 5 848 cows, while in 1902; there were only 4 166 cows on 290 alps in 1864 in the Grisons, the number of cows on 596 alps was 28 890, milk yield of 2 139 955 gallons and in 1909 the number of cows on 822 was only 26 173 and the milk yield 2 364 221 gallons.

The Alpine Statistics for 1911 give the following figures regarding the dairy industry throughout Switzerland: milch cows, 180 564; average grazing time, 91.3 days; total of grazing days, 16 485 493; average milk, 25 423 900 gals., thus the milk yield per cow and grazing day is 3.3 quarts, as against 5.30 quarts in 1864. If the goats' milk, 3 269 818, is added to the cows' milk, the total milk yield of 28 693 718 gals., at about 7 1/2 per gals., represents a round sum of £860 000.

B. *Utilization of Milk and Alpine Bookkeeping.* — The writer gives some examples that wherever bookkeeping is accurately practiced in the Alps, the net profit per gallon of milk has greatly increased, only by an accurate system of bookkeeping, can milk be used in the remunerative way. While in districts where the old dairy system prevails the net price per gallon of milk was from 4 1/2d to 6d, the collective and operative dairies with modern conveniences (at Davos a funicular railway has been made for milk transport) obtained a price of 9d to 10d per gallon.

C. *Dairy products.* — The chief work of the Alpine dairies is the manufacture of whole milk cheeses, skimmed milk cheeses and butter for the market. But in many mountain districts, in spite of the high fat content and rich taste of the Alpine milk, the dairy products are not of first quality. This is often due to the want of a properly instructed staff and the defective arrangements, apparatus and buildings. Single dairies do not possess the technical means necessary for the production of goods of the best quality. A further evil is that the butter is stored up in the herdsman's house and made into cooking butter, which is a cause of much loss to the dairies. The Alpine statistics of the Grisons give the yearly output of butter as 693 000 lbs.; of this about two-thirds, i. e. 462 000 lbs. is sold and then melted down.

Fresh Alpine butter fetches on an average 15 2d. per lb.; the stored butter, if it had been used fresh, would have been worth 20d. The average value of stored butter in autumn is only 11 1/2d. so that

lbs. are only worth £22 137, which is a loss of £4 813. In addition, it loses 5 per cent. on melting and therefore in value, so that the loss is £6 160.

The Manufacture of Cheeses in the Grisons from Skimmed Cow's Milk and Whole Goat's Milk, and the Utilization of these Milks in Germany.

EMER, H. Zur Frage der Bereitung von Käse aus Kuh-Magermilch und Ziegen-Vollmilch in Graubünden und ihre Nutzanwendung auf deutsche Verhältnisse. (Nach hinterlassenen Manuskripten von Bruun von Neergaards). — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Nos. 6, 7 and 9, pp. 84-87, 103-105 and 149-151. Berlin, February and March 1913.

In the Bünden Alps (Switzerland), where the high Alpine pastures and their countless ravines support few cows and many goats, the sparse population and steep Alpine paths make the manufacture of milk cheeses a difficult matter during the grazing season; for this reason, the cheeses are made from skimmed cow's milk and from whole goat's

The writer has investigated to what extent the milk is utilized in various products, and chose for observation alps with a southern exposure and soil rich in lime. On these were pastured during the grazing season, from June 20 to September 20, 45 cows and about 40 young goats; with 60 goats; 3120 gals. of cow's milk and 598 gals. of goats' milk were made into cheese during this time by the 7 partners. The gross yield was as follows:

	£	s	d
1 172.60 lbs. butter	58	1	9
2 589.40 lbs. cheese	44	6	7
499 gals. buttermilk	2	14	0
2 702 gals. whey	4	17	4
Total	£ 109	19	8

One gallon of milk therefore produced a gross return of 7.09d. If the value of the butter, buttermilk and goat's milk (598 gals \times 7.09d = £5 2d) is subtracted, we get the gross return of the skimmed milk; £109 19s 9d — (£58 1s 9d + £2 14s 0d + £17 14s 2d) = £31 9s 10d. The gross return of the whole cow's milk is therefore £58 1s 9d + 14s 0d + £31 9s 10d = £92 5s 7d.

The cost of working it up was 0.56d per gallon or £7 6s 3d for the cow's milk; thus the sale price of the whole cow's milk was 7d — £7 6s 3d = 6.52d per gallon. If the whole milk is to be used

in the valley, it fetches thus 6.05d per gallon.

The high value of the cow's milk is to be attributed, partly to its butter content, partly to the increased price of butter in summer and to the increase in the value of the cheese, owing to the admixture of goat's milk. The writer calculates that one gallon of skimmed cow's

milk when mixed with goat's milk, is worth about 0.62d more, and one of whole cow's milk when mixed with goat's milk is worth about 0.62d more than when cow's milk only is used for making skimmed milk.

It is very important for making such cheeses that a certain amount of goat's milk be available, for the cows give most milk at the beginning of the Alpine season, but the goats are not in full milk till 5 or 6 weeks later; therefore in order to make cheeses of equal quality at the beginning of the season it is necessary to add whole cow's milk.

At the end of the Alpine season, as the amount of goat's milk must be relatively larger and the price of butter has risen, the skimmed milk must have more cream removed.

From these facts, the writer concludes that goat's milk could be used for cheese-making in some parts of Germany. Through employing mixed cow's and goat's milk, the quality of skimmed milk cheese could be improved in Germany, the skimmed milk could be turned to better account, and a large amount of milk protein utilized as a food for people.

414 - On the Forms Assumed by Phosphorus and Calcium in Casein.

LINDER, L. Sur les formes que le Phosphore et le Calcium affectent dans le caséin du lait. — *Annales de l'Institut National Agronomique*, Series 2, Vol. XI, Part 2, pp. 222. Paris, 1913.

These four series of analytic researches aim at showing that a portion only of the phosphorus (about half) occurs as a phosphate, probably tricalcic, while the other enters as phosphoric acid into a combination, which can be hydrolised by alkalis. As for the excess calcium left over from the formation of calcium phosphate, it neutralises the acidity of the casein, but this neutralization is only partial; for it can be made to absorb more than 7 per cent. of calcium, in the same manner as it will absorb aluminium, zinc, etc. It is probable that calcium phosphate is itself broken up by this acidity, for calcium caseinate can be saturated with phosphoric acid without the liquid becoming turbid i. e. without the deposition of the phosphate formed. It is equally possible that calcium phosphate is soluble in calcium caseinate for the casein precipitated by rennet is entirely soluble, without deposit of phosphate of lime, in ammonia, or even in concentrated resorcin.

The writer concludes that phosphoric acid and calcium form three groups of mineral elements: 1) calcium combined with the hydroxyl; 2) calcium phosphate, probably tricalcic, and 3) phosphoric acid retained by the protein molecule and capable of being detached by hydrolysis or saponification.

The study of the sulphur contained in the casein molecule will be the subject of a further communication.

The Jerked Beef Industry in Argentina.

MEAT, JUAN E. *Industria saladeril en la Argentina.* — *Boletín del Ministerio de Agricultura*, Vol. XIV, No. 9, pp. 986-1029. Buenos Aires, 1912.

has often been objected against salted meat that it does not offer it guarantee from a hygienic point of view. According to the writer, it can be more erroneous in the case of Argentine meats. In that the "saladeros" are submitted to continuous sanitary surveillance; an extent that the inspection fees together with the duty on salt (ton) and the provincial taxes (4s per head) weigh heavily on the and contribute to hinder its full development.

Preparation of "tasajo". — The animals whose flesh is dried are of the type ("criollo"), bred in the open and their average live weight is . The amount of dry meat they yield varies from 136 to 235 lbs. sanitary regulations which govern the industry and which provide vere penalties against transgressors, allow nothing but salt to be the industry. Only Cadiz salt, which is very pure, is used. Of ears some works have begun to use "mantas" (the muscular mass e jaws, the neck and the ribs up to the hip bone) for the preparation meat, and "postas" (the mass of muscles freed from bones of each r canned meats and extracts. The animals, after being inspected veterinary surgeon, are slaughtered, bled, flayed, and quartered. mantas" and the quarters are freed from the excess of fat and cut pieces of more or less uniform size. The flesh is sometimes washed, rule it passes at once through one or more (generally three) vats of it is then stacked with salt into heaps about 10 feet high. The are undone every day. The meat is hung in the sun for 7 or 8 hours stacks are remade in inverse order. The process lasts from 12 o a month according to the weather. "Tasajo dulce" is not so the other and is dried in an esiccator.

ie drying of mutton has also been attempted, but hitherto no method n found for freeing the meat from its characteristic odour. the provinces of Salta and Jujuy "Chalona" is prepared; this is nd salted mutton and it is exported to a great extent to Bolivia.

Prices of dried meat.*

	£	s	d	£	s	d
Cuba: «postas» (f. o. b. Buenos Aires)	1	1	0	2	0	6
Brazil: «mantas» (in depot in the Brazilian ports).	1	15	0	3	0	3
» «mantas» and «postas»	1	8	6	1	16	6

* In September 1912 the price at Montevideo was £2 4s 6d per cwt.

Expenses of Importation into Brazil.

	£	s	d
Customs duties, per cwt.	6	4	11
Port dues, per cwt.	2		
Commission, warehousing, per cwt.	4	5	

Total . . . 22s 4d per cwt.

adding to 37s 1d per head (187 lbs. of «tasajo»).

Animals slaughtered for the preparation of dried meat.

Year	Argentina	Uruguay	Brazil	Total
1891-92	764,400	707,800	485,000	1,957,200
1901-02	454,000	813,400	375,000	1,642,400
1910-11	264,415	698,179	499,500	1,462,094
Yearly Average 1891-1911 .	453,494	783,289	368,816	1,605,599

In 1909, 185 100 head of cattle were slaughtered in the principal Argentine factories for the preparation of meat extracts and preserved meat.

The writer refers to a series of analyses and of digestibility tests by Dr. Lavenir and Dr. E. Moreno of Cuba) on the nutritive value of meat.

*Trade.**Exportation of jerked meat from Argentina.*

	Tons	Value £		Tons	Value £
1870-74	166 206	1 324 351	1895-99	175 817	2 789
1875-79	165 803	2 312 486	1905-09	62 197	2 070
1880-84	114 088	2 886 008	1910	9 293	204
1885-89	159 091	3 954 366	1911	12 975	-
1890-94	208 457	4 022 445			

The jerked meat industry has been much injured by the rise of the stored meat trade, and yet the two industries do not exclude each other because they utilize different animals and supply different markets. Some of these could absorb still greater quantities of jerked beef, than are actually supplied, while new ones could be opened. Among the latter Brazil is to be mentioned.

In 1912 there were in the State of Rio Grande do Sul, Brazil, 200 laderos. They were not, however, sufficient to satisfy the demand of the population of Northern Brazil, whose chief food is jerked beef. In 1906 the production of jerked beef in Rio Grande do Sul was 80,240 tons. In the same year the three States of Para, Pernambuco and Bahia

ned 58 364 570 lbs. of this meat. In 1907 the State of Rio Grande consumed 78 899 014 lbs. of it, or almost the whole local production. Brazil consumed 192 951 028 lbs. of jerked beef, whilst the proportion of Rio Grande do Sul was barely one third of the consumption of the whole country.

The repeated attempts to dry meat in Cuba did not prove successful, to the climate being too moist and not warm enough. Similarly all attempts made in Venezuela, in Mexico and in the United States have

other markets in which jerked beef might be introduced or imported in quantities than at present, are the African colonies, Bolivia (which consumed this food up to a short time ago), Peru, Spain, and Portugal (which might increase considerably their present consumption), Sweden and Norway (which import salted meats in barrels from the United States), Porto Rico (which has 1 150 000 inhabitants and only 10 head of live stock, of which 303 000 are cattle), Jamaica, the Antilles, the Republic of San Domingo, Haiti, etc.

A Method for the Determination of Starch in Meat Food Products.

By T. M. U. S. Department of Agriculture, Bureau of Animal Industry, Circular 203, Washington, 1912.

The writer gives a short account of the methods hitherto used for determining the amount of starch present in meat products and afterwards a detailed description of his own method, which is rapid and sure and can be carried out without the use of an autoclave.

The Sugar Industry in North-East Brazil.

By ERSE, PAUL. L'industrie sucrière dans le Nord-Est Brésilien. — *Bulletin des Séances de la Société Nationale d'Agriculture de France*, Vol. LXXII, No. 10, pp. 937-949. Paris, December 1912.

The St. Vincent sugar cane was introduced into Brazil shortly after its discovery and notably into the States of Pernambuco (1534) and São Paulo. For a long time, Brazil was the principal sugar-producing country, but it now occupies the sixth place, coming after Cuba, the East Indies, Java, the Philippines, and Porto Rico. Cane sugar is made in 15 out of the 21 States of the Federation, the annual production being about 300 000 tons. From enquiries made by the writer, it appears that there are 86 sugar factories in the six states of North-East Brazil, viz.

Bahia	22	Sergipe	10
Pernambuco	42	Parahyba do Norte . .	4
Alagoas	6	Rio Grande do Norte .	2

There are, further, in the States in question a very large number of "engenhos" (which can be regarded as semi-factories) and "barguês" (which there are about 1 500 in the State of Pernambuco alone), which

make "muscovado" sugar (average extraction 5.5 to 6 per cent.) for consumption and the market of the interior.

The 22 sugar factories of the State of Bahia are reported to have produced in 1911-1912, 316 992 sacks of white sugar (first and secondings) of 132 lbs. (60 kg.), of which a large portion (189 726 sacks) been exported to the different States of Brazil; only 151 sacks have despatched to foreign ports. The molasses, which are still very rich sent to the cooperative distillery of Santo Amaro.

The 6 factories of the State of Alagoas have produced during the season 188 000 sacks of white sugar, while the output of its 200 "engenhos" is from 400 000; to 450 000 sacks of "muscovado", all in sacks containing 165 lbs. (75 kg.). The four other States have produced approximately:

	Sugar of three qualities		
Pernambuco	1 600 000	sacks of	75 kg.
Sergipe	65 000	"	" 60 "
Parahyba do Norte	120 000	"	" 75 "
Rio Grande do Norte	50 000	"	" 75 "

According to the statistics of the federal customs, the direct and indirect exportation of sugar in 1911 amounted to 79 824 820 lbs. (probable value on board £408 506); of this only 680 487 lbs. were white sugar, as against 67 401 tons in 1909. The importation in 1911 was only 609 878 lbs. (valuable value on board £6 963).

In 1909 (latest statistics) the total exportations were 151 055 200 lbs.

White sugar (powdered)	933 600	lbs.
" " crystallized	76 900	"
Demerara sugar (N. 13 of the Dutch scale)	76 394 700	"
Muscovado	73 650 000	"

The chief buyers were:

Great Britain	112 492 800	lbs.
Argentina	24 070 500	"
United States	13 275 600	"

Average price per cwt. (taking the milreis at 16 $\frac{1}{2}$ d.):

	1909. £ s d	1908. £ s d
White sugar	1 3 5	1 13 6
Demerara	10 10	14 6
Muscovado	9 4	11 5

A tax is put upon exported sugar; this is 1 per cent. in the State of Bahia and 9 per cent. in Pernambuco.

the cultivation factor is always neglected in Brazil. Experiments in selection and reproduction by seed were begun, but soon abandoned. Without any system of rotation, without fertilizers or new varieties of canes, average yield per acre is about 20 tons and, on account of defective canes, 6 per cent. of sugar is obtained from a cane containing double the amount. The yield is 8 to 9 per cent. in Pernambuco and 7 to 8 per cent. in Bahia; in the former State more brown sugar is made than in the second. At a sugar plantation at Atalaia (State of Alagoas), which was managed scientifically, the cane production reached 32 tons per acre. On account of the small wages paid to the labourers, (1 400 reis = 1s per day), the cost of producing sugar is generally between 1d and 1 1/2d

per ton for the industrial factor, it may be said that a modern factory is a rare thing in North-East Brazil. There are only 3 well appointed factories out of 86. Most of them are old factories done up at small expense and they are usually deficient in up-to-date apparatus. The juice is, as a rule, badly manipulated and no attempt is made to economize fuel.

White Liqueur Wines.

ROSE, J. Les vins blancs liqueux. — *Revue de Viticulture*, Year 20, Vol. XXXIX, 1900, pp. 233-235. Paris, February 13, 1913.

White liqueur wines are a special kind containing a larger or smaller amount of grape-sugar, which has escaped fermentation, and a larger proportion of alcohol than usually occurs in ordinary wines and which is usually derived from the transformation of the sugar in the original must.

The alcoholic content of these wines varies from about 13° to 16°, the latter figure is often exceeded; therefore the glucometric density of the must should be higher than 14° Beaumé. It is thanks to two occurrences, partial drying and *Botrytis cinerea*, that the grapes are able to become so rich in sugar. The former is used especially in France, where so-called "vins de paille" are produced, these are made from grapes that have been partially dried on layers of straw: they are liqueur wines, but their production is very limited.

The great majority of liqueur wines are obtained through the agency of the mould, *Botrytis cinerea*, and they are made in the following districts: in France and the neighbouring districts on the two banks of the Gironde, the hills of Monbazillac in the Bergerac district, certain parts of the Layon valley and the district of Saumur, and finally in Germany in the Palatinate and on the banks of the Rhine and the Moselle. In order that *Botrytis cinerea* may have a favourable effect on the grapes, its presence must be attended by the following circumstances: A temperature a little above the ordinary, a sufficient degree of humidity, but the damp must not be continuous, i. e. the rainy periods must be followed by longer periods of fine weather.

The grapes must be the fruit of selected vines and have fairly thick skins and very sweet juice; in the Bordeaux and Bergerac districts these conditions are fulfilled by the Sémillon and Sauvignon va-

rieties, in Anjou by Chenin Blanc, and in Germany by Riesling Traminer.

3. The wines should be grown in somewhat dry soils with an exposure favourable to early ripening; the attacks of the parasite are restrained, but if the fungus occurs on unripe grapes, the disease is severe and gives rise to grey rot, which is always fatal.

Grapes attacked by *Botrytis* soon die and have a tendency to external conditions permit. As the crop is successively invaded, possible to find on the same vine: 1) healthy grapes, with golden, lustrous, smooth skins; 2) those which are completely rotten, with sunken but brown and dull skins and which do not bear the external pressure of the fungus; 3) grapes which are burnt up ("*rotis*") i. e. wrinkled and shrivelled by partial desiccation, and bearing more or less abundant quantities of mould, though the latter are sometimes absent, as in the *Septoria* attacks, when the temperature is higher and the weather drier; it is in October.

The vintage begins as soon as a certain number of burnt-up grapes make their appearance; the berries are gathered one by one at first, when the rot spreads, portions of the bunch are taken, but the whole crop is not gathered until after 7 or 8 successive pickings. The wine is pressed as it is gathered; the operation is always difficult on account of the viscous consistency of the rotten grapes and the concentration of their juice. The density and colour of the must derived from the same pomace increases with pressing, so that it is necessary to equalize the must obtained.

The musts are classed as "head", "centre" and "tail" musts according to their quality, generally speaking, in a descending order; the corresponding wines are designated in the same manner. Frequently in the *ronde* district the concentration of "head" wines may be from 250 gr. per litre, or from 14 to 30° Beaumé; in the other *Botrytis* districts such a high sugar content is much more exceptional, and in order to obtain it, the vintage must be prolonged sometimes as late as December.

The physical effect of the *Botrytis* rot is accompanied by physiological changes; these are shown by a relatively high consumption of oxygen, which allows, by natural concentration, of a considerable increase in the amount of sugar present without the acidity exceeding its limits. Different secretions are also formed: thus a large amount of cerine is produced, which increases the oiliness of the wine; also gelatinous substances, which, though they are for the most part eliminated, still leave certain residues giving mellowness to the wine; finally a large amount of oxydase, the effects of which have to be neutralized by energetic treatment with sulphurous acid.

The fermentation is very slow and in the Bordeaux district finishes in January or February. At this time the wine is drawn off and treated with sulphurous acid fumes to prevent any continuance of fermentation due to a rise in temperature, which would be injurious.

ality of the wine, causing it to lose its sugar and to resemble a.

The subsequent operations consist in racking and fumigating with sulphurous acid every three or four months, and in clarifying the wine. It may only be bottled after having remained in the casks for two or three years; a short time after this, Sauternes wines can be used. If they have to be kept long, it is necessary for them to contain at the time of bottling, sufficient sulphurous acid to hinder oxidation and prevent their resembling Madeira, which would spoil them completely.

In the case of the Monbazillac wines, on the contrary, a brown color, almost mahogany, and a pronounced rank smell and taste are the qualities most prized in old and very liquorous wines. Sometimes the wine does not take place till the wine has remained for 8 or 10 years in casks, owing to fermentation setting up again, liberal application of sulphurous acid being powerless to prevent it.

It is also due to relative insufficiency of sulphurous acid, when the wines of Anjou, which are usually bottled very soon, become graduated of their own accord, more or less sparkling. After ripening, if they reserve their liqueur character together with a slight effervescence, "early" appearance, these wines possess an assemblage of quite valuable properties.

The Rhine wines, although they possess special qualities due to the nature of the vine and to the soil, yet resemble, to a certain extent, the Sauternes or Monbazillac wines according to their sugar content and the amount of sulphurous acid with which they have been treated.

The Ageing of Bottled Wines.

ROUX, U. and DUBOIS, E. Sur le vieillissement des vins en bouteilles. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 1000, pp. 200-202, 1 fig., 1 plate. Paris, February 13, 1913.

Oxygen plays a preponderant part in the evolution of wine; it is more clear that the latter ages more slowly the slower the air is in entering the vessels which contain it. For a long while, wine makers tried to hinder the access of air to bottled wines of good quality. More than a century ago, they tried to attain this result by using corks of the length of those now employed (Château-Lafite 1808). Later on, they were had to ground glass stoppers (Château Lafite 1820-1825). These were given up on account of the difficulty of opening the bottles. Now-a-days, wine is kept in bottles of variable sizes and closed with cork stoppers. The following are some of the sizes used in the Gers district: $\frac{1}{2}$ bottle (0.67 pint); Frontignan bottle (1.31 pint); Anjou (2.64 pints or 2 bottles); Imperial (5.28 pints or 4 bottles); Jeroboam (10.56 pints or 8 bottles).

Experience has shown that the larger the vessel used, the fresher the wine keeps, while, on the contrary, it ages perceptibly faster in smaller bottles.

This is due to the fact that the cross section of the neck is the same in all bottles. The following analyses, made in 1911, show that, other conditions being the same, the changes which take place in the composition of the wine are greater in small than in large bottles.

Léoville-Barton 1881.

	$\frac{1}{2}$ bottle	Whole bottle
Total acidity	3.83 gr.	3.72 gr.
Volatile "	1.07 "	0.95 "
Ethers	0.551 "	0.514 "
Deposit	27 mgr.	25 mgr.
Proportion of deposit to volume .	$\frac{27}{1} = 27$	$\frac{25}{2} = 12.5$

Pape Clément 1887.

	$\frac{1}{2}$ bottle	Bottle	Magnon
Total acidity	3.42 gr.	3.25 gr.	3.23 gr.
Volatile "	0.60 "	0.58 "	0.59 "
Ethers	0.408 "	0.364 "	0.316 "
Deposit	14 mgr.	28 mgr.	31 mgr.
Proportion of deposit to volume .	$\frac{14}{1} = 14$	$\frac{28}{2} = 14$	$\frac{31}{4} = 7.75$

Malescot Saint-Exupéry 1893.

	$\frac{1}{2}$ bottle	Bottle	Magnon
Total acidity	4.20 gr.	3.98 gr.	3.75 gr.
Volatile "	1.26 "	1.24 "	1.13 "
Ethers	0.536 "	0.498 "	0.483 "
Deposit	130 mgr.	205 mgr.	380 mgr.
Proportion of deposit to volume .	$\frac{130}{1} = 130$	$\frac{205}{2} = 102.5$	$\frac{380}{4} = 95$

At the time of analysis, all these wines were in a good state of preservation.

Thus the relative deposit decreases with the increase in size of bottle, the acidity and ether content are less, the flavour is less developed, in a word, chemical analysis here confirms the opinion of the taster: wine ages more slowly in large than in small bottles.

420 - California Fruit and Nut Output.

Daily Consular and Trade Reports, 16th Year, No. 27, p. 579 Washington, February, 1913.

The following comparative statistics are from the *California Grower*, and represent the output of that State in the leading fruit and nut crops. Citrus-fruit shipments were 46 394 cars (1) in 1910-11 and 4 cars in 1911-12.

(1) The California Carload is of 24 000 lbs. (Powell-Wallschlaeger), *The Italian Industry*, p. 9. Los Angeles, 1913.

COMMODITY	QUANTITY	UNIT	PRICE	VALUE
Apples	69 975	76 830	65 300	4 806 525
Apricots	664 110	743 160	838 325	555 869
Blackberries	49 955	62 025	77 825	9 164 671
Cherries	181 935	195 195	158 805	1 864 946
Grapes	24 470	45 645	70 915	2 123 824
Loganberries	4 012	12 639	19 117	2 669 519
Nectarines	14	I	23	81 645
Pears	501 440	619 335	618 920	79 907
Peaches	1 435 160	2 145 450	2 001 125	337 173
Plums	80 425	103 360	165 840	136 835
Raspberries	3 590	10 126	3 623	20 230 125
Strawberries	10 580	14 073	7 715	50 467 000
Other fruit	1 335	3 660	5 115	42 230 000
Total fruit	3 037 001	4 008 549	4 182 650	23 467 446
Asparagus	410 965	617 275	687 065	9 164 671
Beans	12 435	40 250	65 820	1 864 946
Peas	104 010	107 775	184 775	2 123 824
Tomatoes	67 270	1 350 350	1 515 450	2 669 519
Other vegetables	43 050	69 035	63 545	81 645
Total vegetables	1 242 730	2 250 645	2 516 655	337 173
Total	4 279 731	6 259 194	6 699 305	119 782

PLANT DISEASES

GENERAL INFORMATION.

421 - Legislation on Plant Diseases in the Colony of Mauritius.

KOENIG, P. — *Colony of Mauritius, Annual Report on the Forest and Gardens Dept. for 1911*, pp. 16-17, 1912.

In 1882, an Ordinance (No. 14 of 1882) was enacted in the Q of Mauritius to prohibit or regulate the importation of vine plants or tings when affected or supposed to be affected with disease. The me was passed at the request of the Government of the Colony of the Cay Good Hope, to cooperate in prohibiting the importation of Phyllis. No other legislation existed in Mauritius regulating the introduction of plants, fruits, manure, etc., except as regards protection from cattle and animal diseases; against these the Medical and Health Department had been allowed a certain amount of control, chiefly after the break of "Surra", on importations of straw, animal manure and the from countries where cattle plague was prevalent.

On the 30th June 1910, on the invitation of the Secretary of the Colonies, an Ordinance was enacted (No. 4 of 1910), to prevent introduction into the Colony of diseases of plants. The law came effect on the 19th of August 1911, by Proclamation No. 29, prohibiting the importation of certain produce like earth and leaf-mould, animal vegetable manure, cattle fodder, timber with bark on, etc., and allowing landing of other produce after inspection and treatment, if need be, by the Director of Forests and Gardens. It was advised to disinfect the suspicious plants by means of fumes of hydrocyanic acid, but a fumigator has yet been built. As a disinfectant, recourse has often been had to an e sion of petroleum, soap and creoline.

During the service of inspection the presence was ascertained of *michionsaspis aspidistrae* Sign., *Parlatoria proteus* Curt., *Mytilaspis lada* Green on Citrus plants coming from China, Madagascar, etc., at *Hemichionaspis minor* Mask. on pumpkins coming from the Rodrigues.

The Regulation of November 12, 1912, for the Transport of Vegetables in Uruguay.

Reglamentación para el transporte de vegetales. — *Revista de la Asociación Rural del Uruguay*, Year XII, No. 12, p. 921. Montevideo, 1912.

1. — No plant, or portion of a plant, can be transported in the territory of the Republic unless it is accompanied by the necessary certificate furnished by the "Defensa Agrícola," or by the duly authorized inspector, or official of the establishment from which it was despatched.
2. — The transport agents and railway officials must demand the certificate mentioned in Art. 1.
3. — Nursery gardeners and sellers of plants are obliged to receive examination of their products: if the results of the inspection at the establishment is in a satisfactory sanitary condition, a certificate to this effect will be granted.
4. — This certificate will be valid for six months.
5. — The term fixed in the preceding article can be revoked any time at a subsequent inspection proves the existence of disease in the plants, or whenever there is any infraction of the prescribed regulations.
6. — In every case where a new plant, or portion of a plant, which has been transported through the territory of the Republic is found to show signs of an infectious disease, all the responsibility falls upon the giver of the certificate mentioned in Art. 1.
7. — The amount of the penalty incurred is to be fixed for each case that occurs, but shall not exceed the sum of £20.
8. — At least 10 days before the expiration of this certificate, the giver is required to inform the General Direction of the "Defensa Agrícola" of the fact.
9. — In the certificate mentioned in article 1 are to be specified the number and kind of products to be transported and the names and addresses of the sender and the receiver.
10. — The form of certificate is to be that appointed by the General Direction of the "Defensa Agrícola."

Order on the Control of Locusts in Spain.

Orden disponiendo que por los Gobernadores civiles de las provincias que se acuerden se ordene a las Juntas locales de extinción de los pueblos invadidos por langostas, la necesidad absoluta de que el día 31 del actual se encuentren escanados todos los terrenos que en sus respectivos términos estén acotados por conserjos de aquella. — *Gaceta de Madrid*, Year CCLXII, Vol. I, No. 16, p. 139. 4, January 16, 1913.

64 of the present law against the pests of agriculture (ley de Plagas) of May 21, 1908, orders that the operations of cleaning the country of locusts must be terminated by January 31. With the law reminding the authorities that the law must be rigorously observed, a new Order has been issued. It provides:

1) That the civil governors of the provinces of Albaceta, Avila, Ba-

dajoz, Cáceres, Cádiz, Canarias, Ciudad Real, Córdoba, Cuenca, Huelva, Jaén, León, Madrid, Málaga, Salamanca, Seville and Toledo shall instruct the local commissions for the destruction of locusts in the rural districts affected by them, of the absolute necessity of ploughing not later than January 31 all the fields which in the various communes are considered to harbour locusts' eggs.

2) That the Chief Engineers of the respective agricultural districts shall within eight days supply information as to the number of acres already ploughed and of those still unbroken.

3) That the above Engineers shall give their opinion on the probable state of the invasion at the end of the autumn and winter campaign in order to forecast the intensity of the infection in the coming spring and on the efficient remedies for its destruction.

4) That when the proportion of locusts that may hatch in spring is known, the above mentioned civil governors, with their respective provincial councils of agriculture (de Fomento), shall order the local commissions to draw up the estimates of the expenses, in the form set forth by articles 70 and 71 of the Law. Should the Minister of Agriculture (Fomento) lack the funds required for the control of this pest, the Law provides the necessary subsidies.

5) The above Ministry will prosecute contraveners of the Law availing itself of all the means at its disposal.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

424 - The Infectious Chlorosis of Citrus Trees.

TRABUT. Sur la chlorose infectieuse des Citrus. — *Comptes-rendus hebdomadaires des Séances de l'Académie des Sciences*, 1913, 1st Half-year, Vol. 56, No. 13, pp. 29, 263
Paris, January 20, 1913

In orange-groves it sometimes happens that certain trees are attacked by a serious kind of chlorosis, which increases in intensity during the course of two or three years and causes the death of its victim. The chief characteristic of this form of chlorosis consists in its very clear transmission by grafting; for this reason the writer, who has already observed it for two years, suggests giving it the name of "infectious chlorosis". All cuttings taken from a diseased individual give rise to trees which are chlorotic from their second year; the stock itself becomes infected and dies from the same disease, even if the grafted portion is cut off. If this infected tree is grafted again, the disease spreads to the new graft.

According to the writer, two species of orange trees are especially liable to this malady: Washington Navel (coming from England, which was grown under glass) and Siletta, of which grafts were sent from Australia; but it can make its appearance on other cultivated species of Citrus.

the diseased grafts grow vigorously the first year; in the second year they grow extraordinarily freely and bear an unusually heavy crop of fruit. Then the leaves begin to turn yellow along the midrib for a width of 5 mm. on either side. The discoloration afterward spreads to the veins; the leaf has a peculiar appearance, the destruction of the chlorophyll continues, and soon the whole leaf loses its colour. This is a disease, which seems not to have been described yet in America, similar to the "infectious chlorosis of the Malvaceae" of V. Baur.

The writer states that in practice it is easy to prevent the trees contracting this malady, which he has proved by numerous experiments to be communicable by grafting. As M. Trabut found no traces of bacteria for the present Baur's hypothesis, according to which the disease is caused by a phytotoxin secreted by an organism which has been microscopic investigations, but proves its presence by the inoculation results.

BACTERIAL AND FUNGOID DISEASES.

The Contamination of the Soil by the Toxic Products of Parasitic Fungi.

STANFILL, E. Su l'inquinamento del terreno con sostanze nocive prodotte dai funghi parassiti delle piante. — *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXII, 1st Half-year, Part 2, pp. 116-120, Roma, 1913.

D. Ancora sull'inquinamento del terreno con sostanze nocive prodotte da funghi parassiti delle piante. — *Ibidem*, part 3, pp. 170-174, fig. 1. Roma, 1913.

The aim of the writer was to discover if those fungi which attack the ground portions of plants under the natural conditions of parasitism, during their lifetime, secrete sufficient toxic matter to permeate the soil and contaminate the latter for some distance from the part of the plant attacked, or whether these fungi leave toxic substances in the plant parts, even at their death, thus contaminating the soil for a certain period of time.

The first experiments were made in 1910; some sterilized wheat grains germinated in contact with a raw or boiled infusion of *Septoria graminum* or with mould derived from wheat leaves attacked by this fungus. Also in contact with soil impregnated with the same unboiled infusion. Similar experiments were also carried out in 1910, with melon plants of which the crowns were infested by *Fusarium nivium* and with white mustard attacked by a species of *Pleospora*. An attempt was made, in the case of the mustard, to separate the toxic substances by precipitating them from the infusion with 30 to 45 per cent. alcohol. Similar experiments were made in 1911, when the base of the stem of beans attacked by *Sclerotinia Libertiae* and of lucerne infected with *Fusarium incarnatum* were selected.

The results were concordant and thus showed that soil, especially if it contains clay, can be impregnated with toxic products arising from decomposition of vegetable organs infected by fungus parasites.

To avoid the objection raised, that by using entire infected organs in previous experiments, it was impossible to be sure that the toxic material was not derived from the cells of the host plant, pure cultures of *Sclerotinia Libertiana* were employed in 1911, and of *Fusarium incarnatum* in 1912; these were studied in connection with the germination of red clover and lucerne. In the case of the clover, the experiment clearly showed that the unboiled culture liquid (liquid gelatine) was much more injurious than mycelium juice (the mycelium was already old), and lost some of its toxic property on heating; 60 per cent. of its insoluble components were toxic; the volcanic sand (used as a substratum), being composed of coarse crystalline particles, did not absorb any of the toxic substances, while the loam soil retained the great portion of the latter in a form which was not accessible to the roots. The extremities of the roots were withered and brown, or completely decomposed in some cultures, and had not been able to grow more than 263 mm. in length; in another culture, they were undeveloped where the seed had germinated deeply, but in seeds which had germinated at the surface they were withered and brown; this shows that the toxic substances remained in the upper layer of the soil. It appears on the other hand, that the lucerne was stimulated by some substances present in the unboiled culture; but the boiled liquid slightly hindered germination. In any case, the roots of the first seeds which germinated were arrested in their development, and their extremities were discoloured or destroyed in some of the cultures; the roots of the seeds last germinated were on the contrary quite healthy. This proves that the injurious substances had already undergone some change.

The effect of toxic preparations from *Sclerotinia Libertiana* was tested upon chickpea and lentil plants one month old grown on sterile volcanic sand. The mycelium juice produced no alterations; the neutralized boiled culture liquid caused the death of the whole plant in one month, and if the liquid was heated to 100°C., the same effect was produced in two or three days.

In a second note the writer gives an account of similar experiments to those made with a pure culture of *Scl. Libertiana*; these were carried out in 1912 with a culture of *Fusarium incarnatum* isolated from lucerne which was much damaged. This fungus also, according to the different experiments, elaborates toxic compounds of various kinds, amongst which the last analyses, volatile and stable nitrogenous bases predominate; these prevent the germination of the seeds and injure the roots of various Leguminosae.

It still remained to be seen whether these different fungi produced similar effects if the products are allowed to diffuse naturally in the soil. The first experiments made and carried out with suitable precautions with *Fus. nivaeum* on water-melons, *Scl. Libertiana* on beans and *Fus. incarnatum* on sainfoin and clover, proved that from the mycelia of these fungi

on their substratum, which under natural conditions would be the plant attacked, toxic substances can permeate the neighbouring that they would hinder the growth of the roots, or prevent the germination of the seeds of similar plants.

Researches on the Disease Caused by *Rhizoctonia violacea*.

ERIKSSON, JACOB. Études sur la maladie produite par la *Rhizoctonia violacée*. — *Revue générale de Botanique*, Year 25, No. 289, pp. 14-30, figs. 1-4. Paris, 1913.

After a rapid review of the history of this disease and a description of its characteristics in Sweden, where it occurs especially on carrots and beets, the writer mentions, taking previous observations as a basis, that *Rhizoctonia violacea* attacks a large number of host plants, which are very numerous from a systematic point of view. But in going into the matter more closely, it becomes clear that in a place where several species of the disease are growing the disease does not attack all with the same intensity. The parasite has a certain tendency, though a slight one, to give rise to local races. This can be proved (as was done by the writer during the summers of 1898 to 1902 and in the summer of 1911) by parallel inoculation experiments made with infections derived from different species of plants. By this means the writer was able to prove from two series of experiments, that the propagation of the disease by means of the same matter derived from carrots and beets respectively was much more successful, if the subjects of the inoculation belonged to the same species as those which furnished the virus, and became increasingly successful in the case of the other plants experimented upon in the following order: *Stellaria media*, *Myosotis arvensis*, *Galeopsis Tetrahit*, *Erysimum cheiranthoides*, *Urtica dioica*, *Sonchus arvensis*, turnip, lucerne, potatoes; others, such as clover and parsnip, are resistant to the infection.

Having recently re-examined the experimental material collected by Prof. Eriksson, the writer thinks (at least as far as the form of fungus attacking carrots is concerned) that the much debated question of the systematic name of the sterile mycelium known as *Rhizoctonia violacea* is now decided: its proper scientific name is *Hypochnus violaceus* (Tul.) Eriks. This fungus, during its vegetative period, forms upon the roots of many plants a felt-like mass of sterile mycelium, living as a parasite underground, of a reddish-violet colour and characterised by numerous confert filaments which are septate and ramified. From this felt arise round sori, dark brown in colour and resembling perithecia. This is the *stroma* stage. Subsequently the fungus forms round the stems of the plants, or of other species, and immediately above the soil, an annular, membranous pale pink envelope, which often ascends the stems to a height of 5 to 15 mm., sometimes extending over the surface of the soil as a very thin sheet, and produces the basidiophores. This latter is the *basidium* stage.

The name *Dauci* may be given temporarily to the species-form which attacks carrots, and the name *Stellariae* to the species-form which attacks *Stellaria media*, *Myosotis arvensis*, *Galeopsis Tetrahit*, *Erysimum cheiranthoides*, *Urtica*

aloica and *Sonchus arvensis*. Until further experiments and research have been made, it is impossible to decide positively if the fungus found on beets (*Rhizoctonia violacea* sp.-f. *Betae*), on clover, lucerne, also possesses a *Hypochnus* form.

It is remarkable that the fruiting stage of the fungus (at least in case of the sp.-f. *Dauci*) occurs on species of plants other than those in which it is found by the sterile mycelium, and also that the fungus, which in the sterile stage is a pronounced parasite with much power of destruction, appears saprophytic at all in its fruiting stage. The occurrence of the fruiting stage on species of plants other than those of the hosts of the sterile stage in the dioecious habit of many fungi of the rust family; in any case this *hypochne* stage requires further investigations.

In conclusion, the writer mentions the following methods for the control of the disease when it attacks carrots, beets and other roots:

a) At the time the crop is gathered, all stems showing the trace of the disease should be destroyed, by cooking or otherwise.

b) The spots where diseased plants have grown should be marked by rings of sticks; the infected soil should then be treated with a fungicide, e. g. carbon disulphide ($\frac{1}{2}$ lb. in 10 gallons of water, 8 gallons sufficient for 15 sq. yds.).

c) The roots which have been dug up from near the infected plants must be examined at intervals during the winter and all diseased roots destroyed.

d) A rotation of at least 4 years should be adopted, only such crops being cultivated as cannot possibly serve as hosts to the parasite.

e) The dung of animals fed on the contaminated roots must be used as fresh manure.

427 - Researches on the Development and Control of Vine Mildew.

FAES, H. Sur quelques recherches concernant le développement et le traitement du mildiou. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 99, pp. 161-165, February 1913.

It is well known that there is considerable difference of opinion among investigators as to the method of germination of the oospores of vine mildew (*Plasmopara viticola*) in spring. MM. Ch. Richon, Farlow and P. Prillieux believe that the oospores set free at a particular time zoospores which probably infect the vine in the same manner as the zoospores produced by summer conidia. Others, M. Prillieux in particular, are of opinion that the oospores send out a germ-tube, which is modified later into a tubular structure resembling the usual fructifications of the fungus which then project through the stomata of the leaf.

The writer, however, during the numerous researches and experiments which he made on the oospores of many vine leaves of the Chasselas variety gathered in the autumn of 1911, in no case saw any signs of a germ-tube and was never able to infect the upper or lower surfaces of the leaves by means of oospores. The solution of the question necessitates further

but the writer does not think that the oospores can at all readily penetrate in spring and infect the vine.

During the summer of 1912, M. Fies made some further experiments on the infection of vine leaves and bunches of grapes by mildew conidia. As the former were concerned, these experiments confirmed his previous observations: the germ-tube issues from the zoospore and penetrates the interior of the leaf by means of the stomata on its lower surface. In the case of the bunches, the infection of the buds takes place by means of the stomata on the upper part of the petals. The writer obtained very good results in attempting to infect the flowers after the fall of the calyx. Grapes of the size of a pea could only be infected when the conidia were placed on the point of insertion of the pedicel in the grape, or on the leaf itself.

In conclusion, the writer mentions that in 1912, all vines which were treated with sulphur were immune from the attacks of mildew. Repetitive experiments proved that sulphuring the lower surface of the leaves in all cases protected the vines as well as sulphuring the upper surface. The subject, however, needs further investigation.

***Sterigmatocystis nigra* damaging Tobacco in Hungary.**

RAYMOND, A. dohány kormos rothadása. — *Magyar Dohányügyi*, Year XXX, 1913, pp. 2-4. Budapest, February 20, 1913.

During the last two years, a fungus disease which had not been recorded from other countries in Europe has been causing havoc in Hungary. The fungus is *Sterigmatocystis nigra*, known only in North America, where it is called canker or black rot. It attacks tobacco during fermentation and decomposes the leaves, reducing them to a powdery mass.

In 1911, M. Étienne Uray, controller of the purchase of tobacco at Budapest, when buying tobacco for the Royal Excise Office of Hungary, discovered for the first time *Sterigmatocystis nigra* on the leaves. Subsequently the Experimental Station of Tobacco Cultivation at Debreczen made a chemical examination of the material and stated that this was the first time that the fungus had been observed to attack tobacco in Hungary. This new disease is the more dangerous in that the cause of its appearance is the parasite on fermenting tobacco leaves is not known, although the same fungus has been met with upon other decomposing substances.

The writer gives some information on the nature of the disease, and mentions that the black powdery decomposition product of the leaves attacked is directly due to the fungus. No efficacious remedy has as yet been discovered.

429 - A Disease of Tomatoes (1).

BROOKS, F. T. and PRICE, S. R. in *The New Phytologist*, Vol. XII, No. 1, pp. + 13 figs. London, January 31, 1913.

In October 1911 some tomatoes grown out of doors in the neighbourhood of Bristol were found to bear large diseased areas some depressed below the surface of the healthy parts. On the diseased portions of the fruits were found a species of *Cladosporium*, a species of *Macrosporium* and a fungus with pycnidial fructifications. These were, for the most part, indiscriminately mixed, but on some of the diseased areas most recently formed, only the fungus bearing pycnidia could be seen. It was thought, therefore, as was proved experimentally, that the latter fungus was the cause of the disease, the two others being merely saprophytes. At a later date, the same pycnidia-bearing fungus was found on tomatoes grown under glass in the neighbourhood of Cambridge and was observed for two seasons in succession on plants of out-door tomatoes; in the latter cases the lower part of the stem in the region attacked, the cortex being partially destroyed by the fungus which was identified as *Ascochyta citrullina* C.O. Smith, the conical form of *Mycosphaerella citrullina* Grossenbacher. The writers cultivated the fungus isolated from the fruit and the stem, and made inoculations on plants with the parasite obtained from the fruit and stem of the diseased plants.

In one plot of out-door tomato plants in Cambridgeshire, the disease occurred two years in succession and, in view of the apparent absence of a perithecial stage in Great Britain, and of the fact that the tomato plant is an annual, it is not clear how the disease is propagated from one year to another. It is possible that the mycelium hibernates in the dead tissues of the affected plants and that portions of diseased plants left on the ground instead of being burnt, are the means of reinfection if the same plot is planted the following year. The disease attacks out-door plants when they were nearly full-grown, and under these conditions was sporadic, only 3 per cent. of the plants being affected; there is therefore little fear of its becoming a serious pest to growers of out-door tomatoes. Massee has, however, pointed out that this fungus may become a serious epidemic among greenhouse tomatoes.

In consequence of its virulence under these conditions, it is included in the list of pests scheduled by the Board of Agriculture under the "Destructive Insects and Pests Act".

430 - *Botrytis cinerea*.

LAFFORGUE, G. *Le Botrytis cinerea*. — *Revue de Viticulture*, Year 20, Vol. X, No. 1001, pp. 243-254. Paris, February 20, 1913.

A general study of this now dangerous parasite of the vine. The writer deals with the biology, the effects ("Edelfäule", "pourriture grise" of *Botrytis* on grapes and states that the control methods hitherto used for the control of this fungus are inefficacious. Further research is necessary.

(1) See also No. 1546, B. May 1911.

romyces hyalosporus sp. nov., causing the Disease to the Shoots of *Acacia confusa* Merrill.

DA KANEYOSHI in: *The Botanical Magazine*, Vol. XXVII, No. 313, pp. 16-20, Tokyo, January 1913.

"Sōshiju", *Acacia confusa* Merrill, is one of the most useful Formosa, where it is used for avenues and ornamental purposes; furnishes fuel and timber and is planted as a windbreak. Throughout the island there are nurseries of this tree, which is everywhere in the extensive afforestations. The young trees in the nurseries, however, much attacked by a rust-fungus; this especially affects their shoots. When the latter are badly affected uredo-sori in great numbers (even as many as 50) on a phyllode; they often forming large patches, and deform phyllodes and young twigs; with of these is hindered and death subsequently ensues. On trees, both pods and phyllodes are usually affected. The writer gives a detailed description of the agent of the disease, he considers it to be a new species, he proposes it shall be named *Uromyces hyalosporus*.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

On the Behaviour of the Seeds of Wild Plants in the Soil and the Poor Results in the Destruction of Weeds obtained by Cultivation.

FRATI, O. Sul comportamento dei semi delle piante spontanee nel terreno e sulla efficacia dei lavori del suolo per provocare la distruzione delle erbe infestanti. — *Atti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXII, First Half-year, Part 2, pp. 120-126. Rome, 1913.

The age of the seed has certainly much to do with the preservation of the species. The writer observed, in the lower Valley of the Po, within certain limits, most weed seeds germinate more rapidly the longer the time which has elapsed between the time of their ripening (subsequently of their falling to the ground) and the date at which the germinating power is tested. There are in every case some hard seeds even when they are two years old and more. As a rule, it can be said that the less rapidly the seed becomes ready to germinate, the more persistent is the species as a weed.

The seeds of leguminous weeds do not appear as a general rule to be affected by a variation in humidity, and other seeds remain indifferent; there are certain species, such as false oat (*Avena fatua*), shepherd's bagwort (*Capsella Bursa-pastoris*), dock (*Rumex crispus*), sage (*Salvia pratensis*), in which the germination of the seeds is greatly stimulated by alternation of damp and dryness. It is thus erroneous to judge of the behaviour of seeds in their natural habitat by their conduct in the germination

Even in years when the summers are very wet, the seedling not come up in much greater numbers than in dry years.

It is generally believed that seeds which are buried deep ploughing can preserve their vitality indefinitely. The writer has ascertained, by means of a series of experiments, that, at least in which was worked periodically, seeds buried 14 to 18 inches deep, at usual ploughing depth in breaking up the temporary pasture, are under as good germinating conditions as if they had been lightly covered with soil. Should these deeply-buried seeds not germinate, it is probably due to the fact that they would not have germinated in the most superficial layer of the soil.

From these data the writer deduces:

1. Superficial working of the ground (including work done in summer after harvest) is of very little use in controlling weeds which are propagated by seed, (a) because a large number of seeds do not grow, even if they happen to be in the superficial layers of soil, and are periodically exposed to light showers which keep the ground continually, or only intermittently, damp; (b) because seeds which are ready to germinate come up equally well if they are buried in ploughing.

2. The very frequent turning over of the cultivable layer of soil is for the same reasons of little use, for even where the working of soil is the main feature of modern agriculture, weed control has ceased to be of the greatest difficulty.

3. The practice of preventing weeds from ripening their seed and letting them fall to the ground should not be regarded as a means of hindering the propagation of the most harmful weeds, but as the sole certain and efficacious method, besides being the economical.

433 - Noxious Weeds: The Canary Island Broom (*Cytisus canariensis* Steudel) in Tasmania.

BLACK, R. A. in *The Agricultural Gazette of Tasmania*, Vol. XX, No. 12, pp. 108-110, fig. Hobart, December 1912.

This leguminous plant is a native of the Canary Islands, where it is used, e. g. at Santa Cruz, as a hedge or garden plant. It grows in many parts of Tasmania and when left undisturbed soon takes possession of the land. It has already become a nuisance in Victoria, where it has been proclaimed a noxious plant in at least twelve districts.

The writer recommends that this plant should be prevented from spreading by pulling it up and burning it before it goes to seed.

Prof. Ewart points out that the foliage of this *Cytisus* appears to be slightly poisonous.

INSECT PESTS.

**Simultaneous Destruction of *Colaspidea atra* and Lucerne
by Calcium Cyanamide.**

27, L.-E. *Destruction simultane du Négril et de la Cuscuta des Luzernes*, 30 pp. (n. d.).

A succinct account of experiments made on a large scale, during successive years, in the neighbourhood of Montpellier for the purpose of destroying simultaneously *Colaspidea atra* (1) and lucerne. The author states that calcium cyanamide reduced to as fine a powder as possible and applied annually at the rate of 100 lbs. per acre, has so far proved to be the most efficacious remedy both the beetle and parasitic plant, while at the same time, it interferes with the growth of the lucerne. As this small amount of cyanamide is difficult to spread uniformly, the writer suggests mixing it with other substances according to the following formula: cyanamide, 1 part; gypsum, two parts; wood ashes, 1 part.

The Control of *Conchylis* in Switzerland in 1912.

H. La lutte contre le ver de la vigne (*Conchylis*) en 1912. — *La terre Vaudoise*, 5, No. 7, pp. 67-69. Lausanne, February 15, 1913.

In 1912, owing to the unfavourable weather of the previous year, there was a relatively slight development of *Conchylis ambiguella*. On the other hand, *Polychrosis botrana*, which was introduced into the vineyard and also with imported grapes, spread there very much. The writer gives an account of his experiments in the control of the pest in the vine-growing districts of Yverne. Nicotine (2) added to a pyrethrum wash (20 lbs. per 100 gallons) or to a solution of soft soap (20 lbs. per 100 gallons) gave encouraging, if not fully satisfactory, results; the experiments will be repeated in 1913. He did not prove efficacious. Amongst the various insecticides tried were "X-X", "Golaz", "Palaccio", "Glucine" and "poudre de soufre", the first of which the composition is a secret, gave more interesting results and will be used for further experiments.

In order to increase the already potent effects of treatments with a pyrethrum powder and soft soap, the writer made mixtures of pyrethrum powder and nicotine, and of soft soap, pyrethrum powder and lysol, which he is going to test in the open.

In 1912, both in the laboratory and the vineyard, the writer had good results with a solution of soft soap and pyrethrum powder (water 100, soft soap 20 lbs.; pyrethrum powder 15 lbs.). The remedy

¹ Chrysomelid very injurious to lucerne in France, especially in the south. G. Guérin. *Entomologie et Parasitologie Agricoles (Encyclopédie-Agricole)*, p. 161. (Ed.).
² Probably tobacco juice containing 10 per cent. of nicotine. (Ed.).

should be applied in cloudy weather, or any way at night, to the while still very small (2 to 3 mm. = $\frac{1}{10}$ inch.). The best pyre powder is furnished by *Chrysanthemum cinerariaefolium*; the flower should be gathered before flowering, dried and pulverised. With to the possible cultivation of this pyrethrum in the warmer parts of Switzerland, and thus obtaining the powder pure and fresh, M. Fae made in the spring of 1912, making trials of sowing and transplanting in different districts, using seed from various localities.

436 - The Destruction of the Larvae of *Conchyliis* and Aphid on Fruit Trees.

PETIT, A. Destruction des larves de la Cochyliis et des Pucerons ordinaires. — *de la Société nationale d'Horticulture de France*, Series 4, Vol. XIII, Novembre p. 710. Paris, 1912.

The writer states that a simple aqueous solution of white soap, without the addition of any toxic substance, but made in the proportion of at least 10 lbs. per 100 gallons of rainwater is sufficient to destroy *Conchyliis* larvae. The amount of soap must be increased as required if the water be hard. The solution should be applied only to the branches of grapes and a sprayer must be used.

Further, a solution of 4 lbs. of Marseilles soap in 100 gallons of rain-water destroys, according to the writer, the aphides which commonly attack fruit trees.

437 - Enemies of Barley.

NOEL, PAUL. Les ennemis de l'Orge. — *Bulletin du Laboratoire régional d'Entomologie agricole*, Fourth quarter (Oct.-Nov.-Dec.) 1912, pp. 5-7. Rouen, 1912.

List of the enemies of this cereal.

Coleoptera: *Melolontha vulgaris* L., *Agriotes lineatus* L., *Strophodonta* (*Calandra*) *oryzae* Fb., *Lema cyanella* L., *L. melanopa* Hbst.

Hemiptera: *Aphis cerealis* Kalt., *A. avenae* Fb., *Jassus sexnotatus* Flor., *Endeis* (*Aphis*) *bella* Koch.

Lepidoptera: *Agrotis crassa* Fb., *A. clavis* Rott., *Charaxes granata* L., *Asopia farinalis* L., *Orobena frumentalis* L., *Gelechia cerealella* Olf.

Diptera: *Phytomyza cinereifrons* Hardy, *Chlorops taeniopus* M., *Cecidomyia destructor* Say, *C. flava* Meig., an undetermined *Cecidomyia* and *Oscinis tritici* Fb., L.

Nematoda: *Tylenchus devastator* Kühn.

Fungi: *Ustilago Jensenii*, Rostr., *Erysiphe graminis* D C., *Puccinia graminis* Pers., *Helminthosporium gramineum* Eriks.

438 - Cotton Pests in the West Indies.

BALLAU, H. A. Notes on Certain Cotton Pests. — *West Indian Bulletin*, Vol. XIII, No. 1, pp. 34-38. Barbados, 1912.

The flower-bud maggot (*Contarinia gossypii* Felt.) made its appearance in Antigua about the end of 1907, and in 1907-08 destroyed about 1 per cent of the cotton crop. From 1910 to 1912 it did no damage or very little.

eggs of the flower-bud maggot are not known, but it is believed they are deposited within the tissues of the flower bud, the maggots on the stamens and pistils. As many as 43 maggots have been found in one bud. When the attacked bud drops, the maggots make their way into the ground, where they pass the pupal stage and transform into the adult condition. The entire life-cycle probably occupies from 15 to 20 days. This insect has been reared from cultivated cotton, from native cotton, and from wild coffee (*Clerodendron aculeatum*). Chemical and direct remedial measures have given negative results. The occurrence of the flower-bud maggot seems to be associated with conditions of more than ordinary dampness accompanied with cool nights, and such conditions occur in Antigua towards the end of October. Thereby planting has been advised.

During the last few seasons there has been a remarkable decrease in the numbers of the cotton worm (*Alabama argillacea*), due to the action of natural enemies. The following species are known in the West Indies: Egg parasites: *Trichogramma pretiosa* and *Telenomus* sp.; parasites of the larvae or of the pupae: the "fleshy fly" (*Sarcophaga* sp.), Tachinid flies, *Chalcis annulata*; predaceous insects: *Polistes* sp. (called "Jack Spaniard" in St. Vincent and "wild bee" in Barbados), *P. bellicosus* ("cow bee"), *P. fuscatus instabilis* ("Mantis" or "Jack Spaniard"), *Calosoma calidum* ("fiery ground beetle"), etc., and insectivorous birds, the most useful being the Barbados bird (*Quiscalus fortirostris*).

The black scale (*Saissetia nigra* Nietn.) was one of the most serious pests of cotton in Barbados in 1905-06 and in 1907-08. Since this time it has been almost harmless, apparently as a result of the enormous development of an insect parasite, *Zalophothrix mirum* Crawford. This is parasitic on *Saissetia hemisphaerica*, *S. oleae*, *Ceroplastes*, etc. Good results have been obtained by collecting twigs of *Hibiscus* or other plants infested with parasitized scales and tying them to the branches of cotton plants infested by the scale insect. The shield scale fungus (*Cephalosporium* sp.) is also a powerful destructive agent of the black scale, especially during the wet season.

Heliothrips phaseoli sp. nov., Injurious to Beans in Texas.

By J. DOUGLAS. A New Genus and Three New Species of North American Thysanoptera. — *Psyche: a Journal of Entomology*, Vol. XIX, No. 4, pp. 113-118, plates 8-9. Boston, Mass., 1912.

A description is given of a new species of thrips (*Heliothrips phaseoli* sp. nov.), collected by Mr. C. A. Hart near Brownsville, Texas, where it was very injurious to beans in 1908. The beans became yellowish and the crop was greatly diminished. It was also found on a wild bean in Mexico, so that it is supposed that it is a native insect which has attracted attention to cultivated beans.

440 - *Hypolycaena philippus*, an Enemy of Pineapples at São Paulo (Brasil).

BONDAR, GREGORIO. Uma praga do abacaxi (Estudo original). — *Boletim da Agricultura, Indústria e Commercio*, Year I, No. 4, pp. 103-104 + colour. Rio de Janeiro, 1912.

At Campinas (São Paulo) the young and well developed fruit *Bromelia Ananas* L. (*Ananas sativus* Schult), called "abacaxi" "ananaz" in Brazil, are much injured by the larvae of *Hypolycaena philippus* Fabr., a butterfly of the family *Lycaenidae* (blues). The top of the fruits, while still attached to the plants, is deformed and there are blackish cavities inside (which greatly spoil the appearance and depreciate the value of the pineapples) made by the larvae; these penetrate the fruit in order to reach the interior, where they live on the pulp and eject their excrement through the holes they have made; this excrement collects on the surface in the form of soft white masses, which are easily distinguished from the gum which accumulates at times on the surface. When once the fruits are attacked, they rot, or grow deformed; generally two cavities in a fruit are sufficient to render it useless.

Pineapple cultivation being an industry of great importance in Brazil, the spread of this pest might be very harmful. In order to prevent its propagation, the writer counsels the inspection of the plants, in November or December, preferably in the morning when the excrement of the larvae is fresh and more visible, and the following up of the existing infestation in order to capture and destroy the invaders.

